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FINANCIAL ANALYSIS OF OUTSOURCING THE HELICOPTER COMBAT SUPPORT MISSION ABOARD MILITARY SEALIFT COMMAND SHIPS.

by

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Department of Defense leaders plan to use outsourcing to reduce operations and maintenance spending and enable them to increase procurement and research and development spending. Even functions once labeled inherently governmental are now being evaluated for outsourcing in the quest to reduce spending. One such function is the Helicopter Combat Support (HC) Mission aboard Military Sealift Command (MSC) ships.

This thesis evaluates service contract cost escalation rates and compares them to in-house cost escalation rates. Three Navy service contracts were evaluated, two aircraft maintenance contracts and one aircraft simulator maintenance contract. The purpose was to determine if the escalation rates differed enough to significantly affect DOD's ability to reduce spending through outsourcing. This thesis also determines the total in-house cost to perform the HC mission aboard MSC ships and evaluates commercial alternatives. The purpose is to establish the contract cost at which outsourcing this mission will result in long term cost reduction.

This thesis found that service contract costs escalate faster than in-house costs in certain industries. This difference reduces or eliminates anticipated cost savings from outsourcing The total in-house performance cost of the HC MSC mission was determined for two different options currently under consideration.

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FINANCIAL ANALYSIS OF OUTSOURCING THE HELICOPTER COMBAT SUPPORT MISSION ABOARD MILITARY SEALIFT COMMAND SHIPS.

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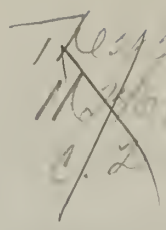

ABSTRACT

Department of Defense leaders plan to use outsourcing to reduce operations and maintenance spending and enable them to increase procurement and research and development spending. Even functions once labeled inherently governmental are now being evaluated for outsourcing in the quest to reduce spending. One such function is the Helicopter Combat Support (HC) Mission aboard Military Sealift Command (MSC) ships.

This thesis evaluates service contract cost escalation rates and compares them to in-house cost escalation rates. Three Navy service contracts were evaluated, two aircraft maintenance contracts and one aircraft simulator maintenance contract. The purpose was to determine if the escalation rates differed enough to significantly affect DOD's ability to reduce spending through outsourcing. This thesis also determines the total in-house cost to perform the HC mission aboard MSC ships and evaluates commercial alternatives. The purpose is to establish the contract cost at which outsourcing this mission will result in long term cost reduction.

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I. INTRODUCTION

A. BACKGROUND

Since the end of the Cold War, United States defense budgets have declined significantly. This decline has forced the Department of Defense to become more creative in its efforts to provide for national security with limited funds. DOD leaders believe outsourcing and infrastructure reduction can reduce operating costs and ultimately provide the dollars necessary to recapitalize and modernize in the future [Ref 1].

The constant pressure to do more with less, has caused DOD leadership to consider outsourcing functions that traditionally have been considered inherently Governmental as well as to re-evaluate its core competencies. One such function the Department of Navy is considering outsourcing is the Helicopter Combat Support Mission on board the Military Sealift Command's (MSC), Combat Logistics Force (CLF) ships. This requires leasing helicopter services from a commercial provider. The commercial provider's personnel would deploy on MSC ships in place of Navy helicopter detachments.

B. OBJECTIVES AND RESEARCH QUESTIONS

This thesis has two objectives. The first objective is to answer the question: In accordance with OMB Circular A-76, what is the total cost to the Government of the in-house performance of the Helicopter Combat Support (HC) Mission aboard the MSC CLF ships? The secondary research questions for this objective are:

(1) Can commercial providers adequately perform the required mission?

(2) What additional factors should the Government consider when determining the total contract cost?

The second objective is to answer the question: Are service contract cost escalation rates substantially different than in-house cost escalation rates? The secondary research questions for this objective are:

(2) What are the effects of any differences?

(3) What causes the differences?

C. SCOPE AND LIMITATIONS

1. Scope

This study is divided into two major parts. First, archival data from service contracts were studied to determine service contract cost escalation rates. These rates were then compared with appropriate in-house cost escalation rates based on indices published by the Navy's Office of Budget. Service contract regulations and Government practices were evaluated to determine their impact on contract cost escalation and explain the differences between contract and in-house cost escalation rates.

Second, a valid supportable in-house cost analysis was completed in accordance with OMB Circular A-76. In-house costs were divided into three categories, capital, personnel and operating costs. After-action reports from two Advanced Concept Technology Demonstrations were studied to determine the feasibility of using commercial providers to fulfill the HC MSC mission. Finally the HC mission requirements were evaluated to assess the comparability of commercial providers and in-house performance.

2. Limitations

Collecting usable archival data for the purpose of determining contract cost escalation rates was extremely difficult. A minimum of five consecutive years of comparable data for each contract were needed to make the evaluation meaningful. Aviation related contract data were sought so that they would be applicable to the HC outsourcing issue. However, these data may have little significance for outsourcing of non-aviation functions.

Aircraft operating costs were determined using Visibility and Management of Operating and Support Costs (VAMOSC) data from the Navy Center for Cost Analyses. VAMOSC data are currently the best data available for this purpose. However, VAMOSC data do have their own limitations and the list of these limitations is provided in Appendix B.

Since DON has not yet issued a Request for Proposal or an Invitation to Bid for the HC mission, it will not be possible to compare the in-house cost to the bids or proposals at this time.

D. METHODOLOGY

This thesis has two separate areas of research, and the methodology for each area will be presented separately. First, the service contract cost escalation data collection process will be discussed. The purpose of this process was to find archival data that could be analyzed in order to determine cost escalation rates for outsourcing contracts and in-house performance of similar functions. The necessary in-house performance data were

readily available. The contract databases maintained by the Federal Data Center do not contain enough information to determine cost escalation rates. For this reason the service contract data had to be collected by contacting program offices and requesting data. Only aviation related program offices were contacted, on the assumption that aviation related data are more relevant to the helicopter services being considered for outsourcing. Few program offices actually provided usable data.

Second, the in-house cost analysis data collection process will be addressed. The purpose of this process was to collect the data necessary to determine the total in-house cost of the HC mission in question. Archival data was collected from the Center for Naval Analyses, the Naval Center for Cost Analysis, the HC community, Commander Naval Air Force Pacific staff, the Naval Safety Center and Commander in Chief Pacific Fleet staff. The archival data were used to project the future total in-house cost.

E. ORGANIZATION OF STUDY

This thesis is divided into six chapters, including this introduction. Chapter II provides the background information necessary to understand the remaining chapters. Chapter III presents and analyzes the service contract, Department of Labor, and DOD cost data. The chapter compares service contract cost escalation rates to in-house cost escalation rates. Chapter IV develops the Government's total in-house cost to perform the Helicopter Combat Support Mission aboard MSC ships. Chapter V provides criteria to evaluate the possible commercial alternatives and examines the feasibility of using commercial alternatives to fulfill the mission. Chapter VI summarizes the research and

provides conclusions and recommendations.

II. BACKGROUND

A. INTRODUCTION

This chapter provides an overview of the issues pertinent to this study. The chapter is divided into two major areas, outsourcing within DOD and the Helicopter Combat Support Community issues. No value judgements are made or intended. The goal is merely to present the issues necessary to understand the remaining chapters.

B. OUTSOURCING ISSUES

1. Definitions

> **Outsourcing** is the operation of a commercial activity for the Government by a contractor. Essentially, it is characterized by the award of a contract for a specific period of time (typically one year) with two or more renewal option periods. The Government retains ownership and control over operations in the activity through surveillance of the contractor. The primary method for outsourcing commercial activities is through competition between the Government and private sector (i.e., under the A-76 program, comparing the cost of in-house to contract performance to determine the most efficient and cost-effective mode of operation).[Ref 2]

> **Privatization** differs from outsourcing in that the Government divests itself of a commercial activity and purchases goods and/or services from commercial sources. The Government may specify quality, quantity, and timeliness requirements for purchased goods and services; however, it has no control over the operations of the activity. The same activity may also provide these goods and services to other customers.[Ref 3]

An **inherently commercial** product or service is any product or service that is produced by private industry for customers other than governments.

2. Fundamentals

The primary purpose of outsourcing is to allow an organization to concentrate on its core competencies, while taking advantage of another organization's core competencies, ultimately leading to reduced cost at the same or better quality. In manufacturing, outsourcing is often referred to as a "make-or-buy" decision. For example, an automobile manufacturer may find it more cost effective to buy windshields from a glass company than to make them. The glass company sells the windshields at a profit, of course, but it is so efficient at making windshields it can sell them cheaper than the auto manufacturer can make them. When one applies this same logic to services, it is called outsourcing instead of "make-or-buy". Large organizations, public or private, often require many different types of services in order to support their core competencies. Although these services may be absolutely vital to their missions, they may not necessarily be good at them. It is easy to believe that an auto manufacturer may not be the best windshield manufacturer, but it can't sell cars without windshields. Government has the same problems. The Federal Government is so large that it is impossible to list all of the services required to keep it running. It is fair to say that Government agencies are not always the most efficient and/or effective organizations.

3. Department of Defense Perspective

Outsourcing has recently become an everyday word within the Department of Defense. DOD has placed new emphasis on outsourcing because decreasing budgets have forced it to find more cost effective ways to provide for National Security. DOD

budget officials have stated that they expect a $3 billion per year savings as a result of outsourcing by the year 2003. The Quadrennial Defense Review (QDR) states the following: [DOD] "demonstrates that it can enjoy many of the benefits that private industry has gained from outsourcing - tighter focus on core tasks; better service quality; more responsiveness and agility; better access to new technologies; and lower costs."[Ref 4] Outsourcing is a two way street, however, and the QDR omits the disadvantages associated with outsourcing. According to studies by RAND Corporation [Ref 5] and the General Accounting Office [Ref 6], outsourcing does have some drawbacks. Some disadvantages to be considered are the inflexibility of Government contractual agreements, loss of real time control by the Chain of Command, and an inability to deal with surge capacity requirements [Ref 7].

Consider some of the advantages and disadvantages of outsourcing in more detail. Outsourcing provides a tighter focus on core tasks; this is the primary reason for outsourcing in industry and in Government. Proponents believe that, by avoiding the functions that distract or impede the organization from its core competencies, it can achieve better overall quality and lower cost. However, once a function is outsourced, some amount of control over quality and flexibility of service is lost. In theory the service provider should be more adept and skilled at performing the service and, therefore, quality should improve. In general the ability to focus on core tasks should improve overall quality. An outside provider may offer more responsiveness and agility. This is true when dealing with a competitive industry that is large enough to absorb changes in volume. It should be easier to add to or subtract from a service contract than to hire employees and

rebuild infrastructure.

On the other hand, if a job is being performed by military members and the Chain of Command wishes to change the schedule or a requirement, the order is given and the change occurs. This is not so simple with contracts. The Command must go through the contracting office, which may be located locally or in a different time zone. The Federal Government deals with contractors in a fundamentally different way than private industry. Private companies often form partner-like relationships in which they depend on each other, each understanding that it is in their own interest that their partner makes a profit. They help each other compete against the other companies in their respective industries. The Government and its contractors are required to comply with many regulations which make these partner-like relationships difficult, if not impossible. Although outsourcing can provide improved service at a lower cost, it is not always a win-win situation, and each case must be evaluated carefully. One of the first things that must be done is a complete cost comparison. This is often very time consuming and difficult because the Government does not really know how much activities actually cost.

4. Regulations and Policies

a. Office of Management and Budget (OMB), Circular A-76

OMB Circular A-76 establishes the Federal policy regarding the performance of commercial activities. A commercial activity is one which is operated by a Federal executive agency and which provides a product or service which could be obtained from a commercial source. A commercial activity is not an inherently

Governmental function. An inherently Governmental function is a function which is so intimately related to the public interest as to mandate performance by Government employees. A-76 states,

> In the process of governing, the Government should not compete with its citizens. The competitive enterprise system, characterized by individual freedom and initiative, is the primary source of national economic strength. In recognition of this principle, it has been and continues to be the general policy of the Government to rely on commercial sources to supply the products and services the Government needs.[Ref 8]

A-76 requires that, " the Government shall not start or carry on any activity to provide a commercial product or service if the product or service can be procured **more economically** from a commercial source."[Ref 9] Exhibit 1 in OMB Circular A-76 lists all of the conditions permitting government performance of commercial activities and the conditions permitting contract performance of commercial activities. In Exhibit 1 one of the performance conditions is lower cost. This condition calls for a cost comparison to determine the lower cost alternative. The majority of OMB Circular A-76 provides instructions for the conduct of the cost comparisons. In general, the cost comparison process consists of six major components. They are 1) the development of a Performance Work Statement (PWS) and Quality Assurance Surveillance Plan (QASP); 2) the performance of a management study to determine the government's Most Efficient Organization (MEO); 3) the development of an in-house Government cost estimate; 4) issuance of the Request for Proposal (RFP) or Invitation for Bid (IFB); 5) the comparison of in-house cost against a proposed contract or Inter Service Support Agreement (ISSA) price, and 6) the Administrative Appeal Process, which is designed to assure all the costs

entered on the Cost Comparison Form (CCF) are fair, accurate and calculated in accordance with Part II of OMB Circular A-76 [Ref 10]. The PWS ensures all bids and proposals are for the same work requirements, so they may be judged equitably. The guidance provided in A-76 is to be used by Federal agencies to ensure that cost comparisons are fair and reasonable. OMB Circular A-76 provides very detailed instructions for the conduct of cost comparisons. It levels the playing field between public and private competitors. A-76 requires that the in-house cost analysis include expenses for cost of capital, insurance, and depreciation, just as if the Federal agency were a private contractor. If done correctly, the in-house cost analysis will include all Government expenses and, therefore, allow private industry a fair opportunity to win the competition.

b. Service Contract Act of 1965

The Service Contract Act of 1965 (SCA) applies to "all contracts in excess of $2500, or an indefinite amount, the principal purpose of which is to furnish services through the use of service employees."[Ref 11] Most but not all outsourced contracts are subject to SCA. SCA requires all contractors and subcontractors to pay all of their employees involved in the performance of the contract the prevailing industry-regional wages and fringe benefits. The Department of Labor (DOL) determines these prevailing wages by conducting industry surveys. The prevailing wage determinations are segregated by Standard Industrial Classification (SIC) and geographic region. Furthermore, if the preceding contract provided substantially the same services in the same locality and the wages and fringe benefits were provided for under a collective bargaining

agreement, then the new contractor must provide the same or greater wages and fringe benefits. This also applies to any and all subcontractors as well. There is an "out" from this clause. If the contractor petitions DOL for a hearing and DOL determines that the wages and fringe benefits provided under the previous collective bargaining agreement are substantially at variance with the compensation for the SIC and locality, then the wages revert to the DOL determination. Finally, the Government agency issuing the contract is required to insure contractor compliance with the Service Contract Act of 1965. If the agency accepts a bid and begins work under a contract agreement and the agreed upon compensation is not in compliance with SCA, then DOL will require the contractor to retroactively comply with SCA and the Federal agency to pay additional costs to the contractor based on the new compensation rates.

c. Small Business Act

The Small Business Act requires Government agencies to award some contracts to small and socially or economically disadvantaged businesses, even though they are not the low bidder. This act doesn't affect as many outsourcing contracts as SCA, but it does affect some. Twenty percent of the total dollar value of all contracts each fiscal year should be awarded to small businesses and five percent of the total should be awarded to disadvantaged businesses. The small and/or disadvantaged businesses must submit a bid that qualifies as "fair market value". However, this means they can bid as high as ten percent over the lowest bid and still be awarded the contract.[Ref 12]

d. Walsh-Healey Act

The Walsh-Healey Act applies to Government contracts in excess of $10,000, for which the primary purpose is the purchase of manufactured or remanufactured goods. Like the Service Contract Act, this act requires contractors to pay their employees the prevailing industry wages and benefits as determined by the Department of Labor. The Walsh-Healey Act differs form the Service Contract Act in three very important ways: 1) the Walsh-Healey Act has no collective bargaining agreement clause; 2) the Walsh-Healey Act does not apply to purchases of such materials as may usually be bought in the open market; and 3) all liability for compliance with the act is born by the contractor.[Ref 13]

C. HELICOPTER COMBAT SUPPORT COMMUNITY ISSUES

1. Mission and Composition Overview

This section provides some background information on the Helicopter Combat Support Community (HC) and the specific outsourcing issue being considered. The HC community is the oldest helicopter community in the Navy. The Navy has long recognized the virtues of helicopters for logistics and combat support purposes. Today's Helicopter Combat Support Community performs many diverse missions. The primary missions of the HC community include day/night Vertical Replenishment (VERTREP), Vertical Onboard Delivery (VOD), day/night amphibious Search and Rescue (SAR), and air head operations. Secondary missions include Special Warfare Support (SWS); recovery of torpedoes, drones, Unmanned Aerial Vehicles (UAVs) and Unmanned Undersea Vehicles

(UUVs); Noncombatant Evacuation Operations (NEO); aeromedical evacuations (MEDEVAC); humanitarian assistance; and disaster relief. The community consists of six operational squadrons and one fleet replacement squadron (FRS) [Ref 14]. The FRS and four of the six operational squadrons operate the CH-46 Seaknight helicopter. The four operational CH-46 squadrons deploy on board ships in small detachments consisting of two helicopters, the necessary crew and maintenance personnel. These detachments deploy on L-class amphibious assault ships and various multi-product logistic ships. From the logistic ships, the helicopters are used for VERTREP, Search and Rescue, and the transfer of passengers, mail and important cargoes to and from various ships in the battle group. These detachments spend a large portion of their mission flight hours performing the VERTREP mission. The VERTREP mission is essential to underway replenishment. Although all Navy combatants and supply ships are capable of connected replenishment (CONREP), CONREP alone is not fast enough to meet the needs of the Navy [Ref 15].

The Navy's current inventory of CH-46 helicopters is very old and in need of modernization. The airframes are approaching their specified flight hour limits. The Navy plans to replace the CH-46's with CH-60's. The Navy is considering outsourcing the HC mission aboard some Military Sealift Command ships. That would require the purchase of fewer CH-60 helicopters.

The Military Sealift Command operates 27 of the Navy's Combat Logistics Force (CLF) ships, 14 oilers (TAO), 5 ammunition ships (TAE) (one more TAE is expected), and 8 combat stores ships (TAFS) [Ref 16]. Manned and operated by civilians, these ships deploy with a CH-46 helicopter detachment embarked. The HC mission aboard the

13 ammunition and combat stores ships is being recommended for outsourcing.

2. Logistics Requirements

The Center for Naval Analyses (CNA) conducted a study [Ref 17] to determine how many Naval logistics helicopters are necessary to support the National Security Strategy of conducting two nearly simultaneous major regional conflicts. CNA's concept for the study was that, to sustain the fighting units, the average logistics resupply should occur at the same rate as consumption. This study addressed the requirements of the amount of cargo needed to be moved and the maximum time each combatant could spend receiving stores, as opposed to engaging in combat. The aircraft carriers and the large deck amphibious assault ships require the most cargo and are afforded the least amount of time to receive stores-- 12 hours for the carrier and 18 hours for the amphibious assault ship. By evaluating lifts per hour per helicopter, CNA determined the minimum number of helicopters required. This minimum number changed as a function of lift capacity of the specific helicopter type. CNA determined two helicopters per support ship are required when the helicopter lift capacity is 2.0 to 2.5 tons. It also determined that the requirement could be decreased to only one helicopter on the TAFS if the helicopter had a 3.5 ton lift capacity. The AOE and TAE still required two helicopters. The HC community leaders accepted the CNA study results. The current procurement plans for the CH-60 are based on the requirements in the study and the option of outsourcing the mission aboard the TAE's and TAFS's, which is currently performed in-house using CH-46's. The following chart summarizes the lift capabilities of the different type helicopters evaluated by CNA as

candidates for the combat support mission.[Ref 18]

Candidate HC Helicopters
VERTREP Characteristics

Helicopter	External Loads: Ordnance, Provisions & Stores (tons)	Internal Loads: Fleet cargo (Tons)	Internal Loads: Mail (Tons)	Internal Loads: Passengers
CH-60	**3.5**	**1.5**	**1.0**	**15**
MD-101	**3.3**	**2.0**	**2.0**	**18**
HH-60H	**2.5**	**0.75**	**1.0**	**09**
K-MAX	**2.5**	**0.5**	**0.3**	**00**
CH-46	**2.0**	**2.0**	**2.0**	**16**
SH-60B	**0.8**	**0.5**	**0.5**	**04**

3. CH-60 Procurement Plan

The current Helo Master Plan requires 194 CH-60s to replace the CH-46s, H-3s, HH-60s, and H-53s necessary to meet the needs of the CLF in accordance with the National Security Strategy [Ref 19]. This requirement includes 24 aircraft, or approximately 14% of the operational aircraft, for the Fleet Replacement Squadron. If the Navy decides not to outsource the MSC HC mission, then it will need an additional 23 or 32 CH-60's, depending on whether the TAFS detachments are reduced to one helicopter. This decision has not yet been finalized. The breakdown for helicopters required if the mission remains in-house is as follows:

MSC Support CH-60 Requirement

	6TAEs	8TAFSs	FRS	Total
One Aircraft per TAFS	**12**	**08**	**03**	**23**
Two Aircraft per TAFS	**12**	**16**	**04**	**32**

The CH-60 is still in the early stages of the procurement process; the Operational Requirements Document has not yet been signed. The CH-60 is being procured in conjunction with the Army's UH-60 as a variant of the UH-60. The first CH-60's are expected to arrive in the fleet in fiscal year 1999.

4. CH-60 Capabilities and Features

The list of CH-60 expected capabilities is provided below. This list was derived from conversations with and information from the Program Manager.[Ref 20]

CH-60 Capabilities and Features

**** Compatible with all CLF ships. No required hangar or flight deck modifications because the CH-60 is equipped with Blade fold and Tail fold systems

**** Proven to be transportable by C-130, C-5

**** 9000 lbs Cargo Hook/Handling system

**** 15 seat cabin for 13 passengers and 2 crewmen or 3000 lbs cargo and 2 crewmen

**** MEDEVAC capable

**** Day/Night VFR/IFR over water navigation system

**** Night over water hover system and rescue hoist; the CH-60 is day and night SAR capable

**** Endurance of 2 hours with internal tanks and greater than 6 hours with external tanks

**** Minimal initial impact on Navy's logistics support system followed by a large reduction in logistics expense once all H-60 Navy achieved

**** The CH-60 is compatible with the Hellfire Missile. With minor modifications it is also compatible with the following weapon systems: the 30mm gun pod - the 20mm gun pod - 2.75" rockets - stinger missiles.

III. SERVICE CONTRACT COST DATA PRESENTATION AND ANALYSIS

A. INTRODUCTION

The goal of this analysis is to compare contract cost escalation to in-house cost escalation and analyze the effects of any differences. The analysis will include examination of archival data provided by different program contracting offices, by DOD records and by the Bureau of Labor Statistics. The analysis will also include input derived from conversations with the many contracting officials contacted during the data collection phase, as well as the personal experiences of the researcher. This chapter is divided into four remaining sections.

The hypothesis section describes the hypothesis which this data was collected to test and the general thought process behind the hypothesis.

The Policy Problems and Concerns section provides a critical analysis of current policies which the researcher believes negatively affect the economic benefits of outsourcing.

The Data Presentation and Analysis sections are self explanatory. This is an analysis of outsourcing not privatization. The DOD definitions of these two terms are provided in the Background Chapter.

B. HYPOTHESIS

Hypothesis: Service contract costs escalate faster than in-house costs for similar functions.

The Center for Naval Analyses conducted a study of outsourcing based on A-76 competition data received from the Office of Privatization. The study, "An Examination

of the DOD Commercial Activities (CA) Competition Data," looks at the public versus private competition process [Ref 21]. The study is based on only the competition data. This was confirmed by speaking with Derek Trunkey, one of the authors.

The CNA study shows that the A-76 competition process results in the prediction of savings to the government. These predictions of savings occur no matter who wins the competition, the Government's Most Efficient Organization or the private sector. The bids are on average 31% less than the original baseline costs. Therefore, CNA concluded that it is to the Navy's benefit to compete every possible function for outsourcing and that the Navy could save in excess of two billion dollars annually. The CNA conclusions may be a little premature. No follow-up was done to see if the predicted savings ever materialized or, if they did materialize, if they were sustained and for how long. In other words, what happens throughout the life of the project? It should be noted that in A-76 competitions won by the Government, a follow-up study is required to ensure the Government has reduced its manning down to the Most Efficient Organization. This chapter will take the next step and answer the question: what happens to the contract price in the follow-on years? There are three possibilities. 1) The contract costs increase at a faster rate than in-house costs; then long term savings are negated. 2) The contract costs increase at slower rate; then long term savings are magnified. 3) Contract costs increase at the same rate as in-house costs. Figure 3-1 presents two graphs which illustrate the first two of these three possibilities.

In Figure 3-1 the assumed initial savings is 25%. This 25% initial savings is based on the average difference between contractor bids and Government MEO bids when the

contractor wins the competition. This average difference was determined by evaluating the Navy competitions in which a contract was awarded. The total of the contractor bids was 25% less than the total in-house cost. Notice that the initial 25% savings in Figure 3-1b is relatively small when compared to the loss or savings after 20 years of differential inflation.

It appears that studies in this area seem to be focussed on determining the theoretical initial annual savings. The CNA study converted the theoretical first year savings into 1996 constant dollars and estimated huge annual savings. It assumed that all costs, contract and in-house, increased at the same average annual rate over the life of the study. This assumption is not valid.

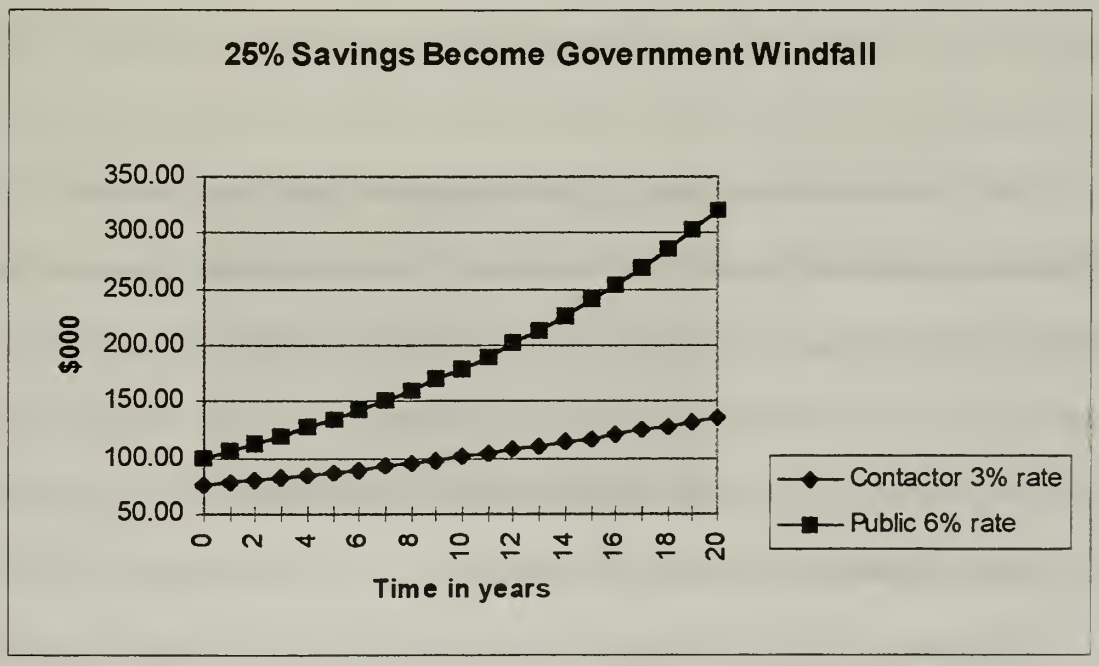

Figure 3-1a

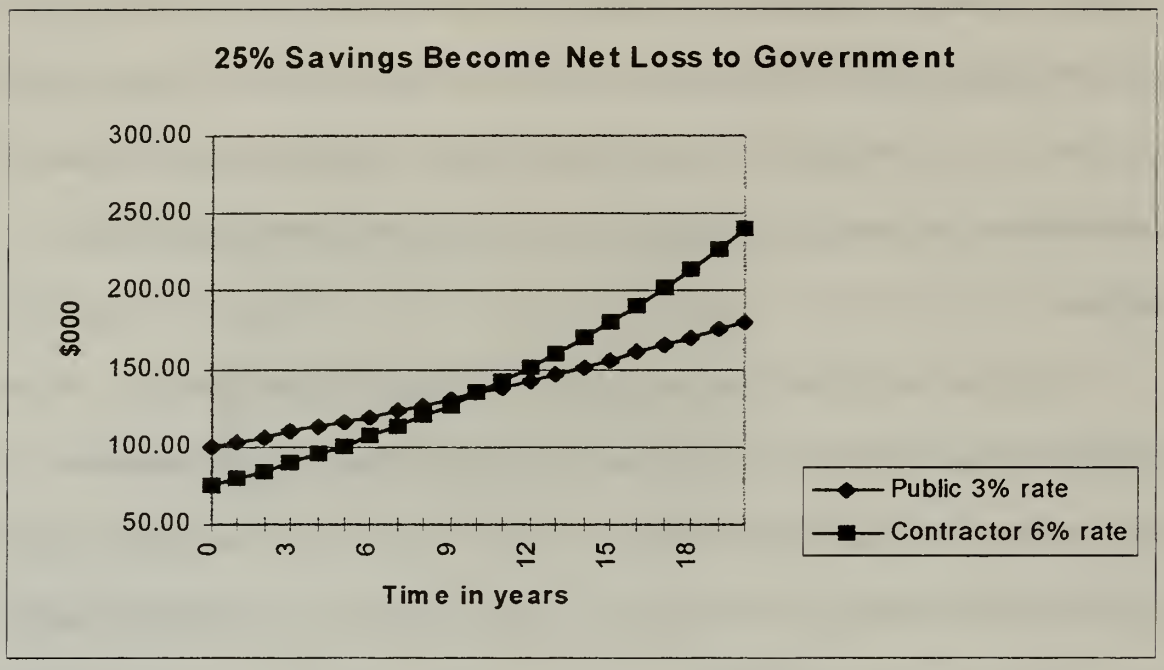

Figure 3-1b

There is evidence that contract costs and in-house costs inflate at substantially different rates and that, by ignoring this evidence, the Government is making outsourcing decisions which often do not save money and may ultimately cost the Government far more.

C. POLICY PROBLEMS AND CONCERNS

Unfortunately, not all government outsourcing practices and policies are conducive to saving money. This section addresses some of the current practices and policies which impede the economic benefits of outsourcing. Information about these policies is derived

from reading relevant Government instructions and conversations with contracting administrators of the different program offices which were contacted for the purpose of data collection.

1. Follow-up

Follow-up studies are **not** required. Once a function is outsourced, the government rarely looks back to ensure the anticipated savings were ever achieved. No requirements are in place to ensure the necessary data for such follow-up studies are even maintained, let alone in any type of user friendly format. Program contracting offices are required to maintain contracts and data only until the contract is closed out (after the final option year). Once closed out, contracts are forwarded to the Federal archives. The Federal Data Center does maintain data on all contracts over $25,000.00 for 15 years; the data is provided to the Federal Data Center via Form DD350. Form DD350 does not contain information on contract volume or unit price, nor does it have a field linking it to the previous or follow-on contracts. The data from the Federal Data Center is not useful for the purpose of determining contract inflation. Furthermore, when researching service contract inflation rates, not one contracting officer or program office was able to provide any historical inflation information. (Some contracting offices did maintain contract data but they did not take the time to measure the annual cost increases.) Many contracting officers said that the new contracts changed so dramatically that it is not possible to compare them with the old contracts. These changes generally involved changing the units on which contract costs were based. For example, a contract for simulator

maintenance originally paid for services based on number of training hours (the hours the simulator was used for training). The contract was changed so the costs were based on the number of hours the simulator was available for use. This change allowed the Government to include a performance clause based on the simulator availability rate. According to the contracting officials, the new contract provided a better value to the government [Ref 22]. In other cases similar work from different geographic locations were combined or separated. When the contracting officials stated that the contract data were unsuitable for the purpose of this thesis, they were unwilling to provide the data. Some simulator data were provided that were incomparable because the units on which the contract costs were based changed, as mentioned above. Since the actual number of training hours covered under the new contract were not available, a comparison is not appropriate.

2. Limited Competition

OMB Circular A-76 has no requirement for a minimum number of bidders before an agency can outsource. It is impossible to have competition without competitors. Competition is the economic foundation on which the ability to control costs is built. Without an adequate number of willing suppliers to fill the government's service needs, it is impossible to control costs. The recent trend of mergers in the Defense industry contributes to the problem by decreasing the number of competitors. The lack of competition, coupled with the current regulatory environment and lack of follow-up studies, provides incentive for contractors to "buy in", or underbid the first year so they

can get the government to outsource. Once the government does away with the infrastructure and personnel, switching back is expensive. Furthermore, public versus private competitions are only required when the Government is performing a commercial activity; they are not required if the commercial activity is contracted out.

3. Social Policy

The Small Business Act requires the Government to give special consideration to small businesses and socially or economically disadvantaged businesses. A small business can be as much as 10% more expensive than the low cost bid of a large business, and yet the contract must still be awarded to the small business, all other things being equal. The same applies for women and minority owned businesses. It is difficult to control contract inflation rates when the contracting officer is **not** authorized to choose the low cost provider. Now, even with a large number of bidders, the government may still overpay by as much as 10% above the most economical rate in any given year.

4. Service Contract Act of 1965

Outsourcing contracts are primarily service contracts, and any service contract over 2500 dollars is subject to the Service Contract Act of 1965 [Ref 23]. The requirements of the Act are summarized on page 12. Many of the people interviewed discussed how the Department of Labor Wage Determinations forced them to pay their contractors additional money. Furthermore, the contracting official for the TH-57 helicopter, mentioned that collective bargaining agreements aggravated the problem. He

observed that, once the contract was signed and work started, the contractor had no incentive to hold out against the union's demands, because the Government will pay the contractor for extra labor costs. Furthermore, when his competitors bid against him during the next competition, the competitors are required to base their bid on the same labor rates set forth under his collective bargaining agreement. Other companies are not allowed to underbid the **labor rates** once they are set by a collective bargaining agreement.

D. DATA PRESENTATION

1. Overview

Government contracts are very dynamic in nature, making it difficult to compare contracts from different years. It was difficult to find contracts that were stable long enough to compare with follow-on contracts. Three contracts with at least five consecutive years of usable data were found, two aircraft maintenance contracts and one aircraft simulator maintenance contract. In all three cases, contracts were compared to their option years. An option year is an option for the government and the company to extend their contract for an additional year. The basic contract remains the same. Some economic and volume adjustments are made and the contract is renewed. The contract is not submitted for competitive bidding if an option year is exercised. In the case of the TH-57 Maintenance Contract, the data are from three successive contracts and their option years. However, the prime contractor did not change. The graph and table presented in Figure 3-2 show the average annual cost increase of each of three contracts

over the period from which data were available compared to the average annual public sector cost increases over the same time period. The data clearly demonstrates that these contracts had a significantly larger average annual cost increase than did similar in-house functions. In this case the in-house cost increases were derived from aircraft maintenance cost indices. Aircraft maintenance costs are funded from three different appropriations. They are Military Personnel Navy, Operations and Maintenance Navy and, Aircraft Procurement Navy. Escalation tables published by the Department of Navy Office of Budget contain the escalation factors for all of the Navy appropriations. Each of the three factors was weighted based on its contribution to total aircraft maintenance costs. All the data collected are from contracts in aviation related areas, two aircraft maintenance contracts and one aircraft simulator maintenance contract.

Average Annual Inflation Rates; Public vs Contractor			
Contract	year	Public	Contractor
TH-57 Maintenance	1986 to 1996	2.97%	6.19%
Simulator Maintenance	1992 to 1997	2.27%	5.48%
C-12 Maintenance	1992 to 1996	2.40%	4.52%

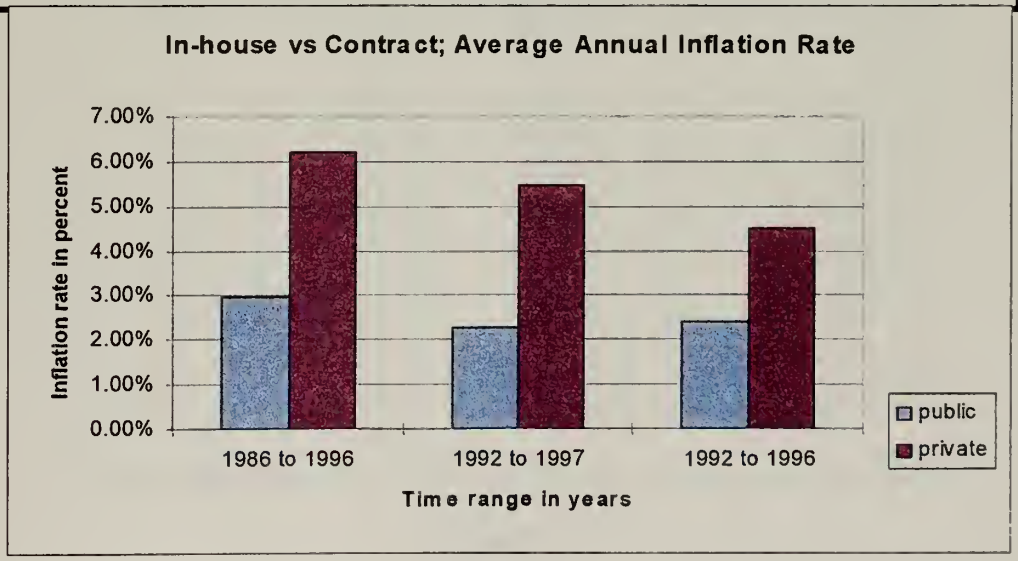

Figure 3-2

2. TH-57 Maintenance Contract

The TH-57 is the Navy's designation for the Bell Jet Ranger, a very popular commercial helicopter. The only data provided for the TH-57 maintenance contract were total annual cost and annual flight hours supported by the contract. After converting the data to cost per flight hour, the average annual cost increase was determined. The contracting office was in the process of relocating; so, any additional data were unavailable. The contract manager indicated that their were no significant changes in service requirements and that the composite labor rate paid to the contractor had more than doubled since 1982. UNC Aviation Services/Burnside-Ott, the prime contractor, does have a labor union and the labor rates are negotiated under a collective bargaining agreement. It has had the contract since 1983. It changed names to UNC Aviation Services in 1991 and won the contract for the fourth time in 1995. The data are provided in Figure 3-3. The different colors represent different contracts and their corresponding option years.

TH-57 Contact Data			
Year	Contract Cost	Flight hours	Cost per Flight hour
86	$ 17,150,028	92994.2	$ 184.42
87	$ 18,450,968	95620.4	$ 192.96
88	$ 20,515,357	90873.3	$ 225.76
89	$ 19,026,068	95569.6	$ 199.08
90	$ 19,040,183	85949.9	$ 221.53
91	$ 18,700,374	79002.2	$ 236.71
92	$ 19,260,139	77677.9	$ 247.95
93	$ 21,976,000	77643.7	$ 283.04
94	$ 21,874,000	75360.1	$ 290.26
95	$ 20,636,654	61906.4	$ 333.35
96	$ 20,202,444	60057.7	$ 336.38
Average annual escalation rate			6.19%

Figure 3-3

Figure 3-4 shows the effect that the differential inflation would have on this contract if the average annual rates were to remain the same for twenty years. The data only cover ten years. Year zero starts with an assumed 25% savings, that is, the contract cost starts 25% below the Government MEO cost. This assumption is based on the average difference between contract bids and total in-house costs. Figure 3-4 is presented to demonstrate the effect of an inflation differential of this magnitude; the starting point for the contract cost is the 1986 contract cost. The initial in-house cost is the contract cost divided by .75. Note that the lines intersect before the ten year point. This cost increase differential actually occurred from 1986 to 1996. Therefore, if this contract saved the Navy 25% in 1986, it is now costing the Navy more than it would to perform the maintenance in-house.

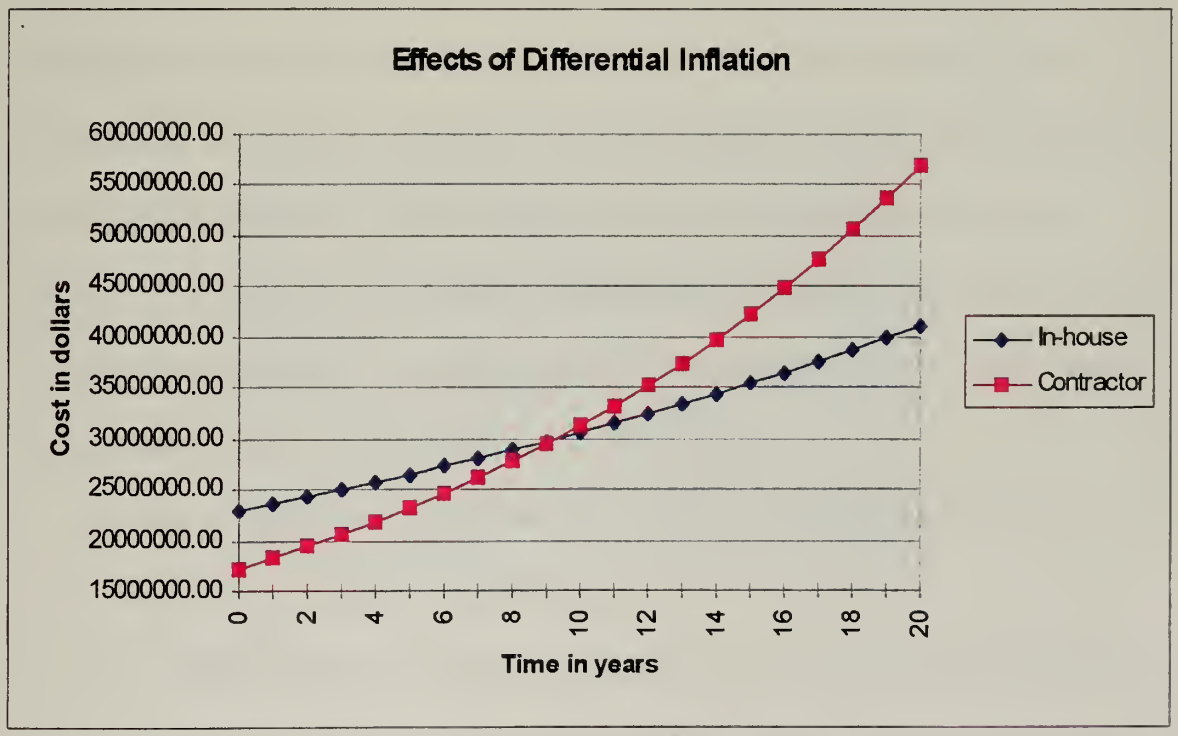

Figure 3-4

3. Simulator Maintenance Contract

The simulator maintenance contract data provided cover one relatively small simulator maintenance contract from 1992 through 1997. This contract has many different line items (more than 30), and line items were added and subtracted throughout the option years. However, the manner in which the option year contract prices were modified allows for an interesting and relevant comparison. The option years of the contract were adjusted for Department of Labor wage determinations after the fact, instead of beforehand. On the delivery orders, which were made from the funding documents, the DOL wage adjustment was added to basic cost at the end of each fiscal year. For example, in FY 1995 the contractor price was increased $250,462.00 over the basic rate, which was based on FY 1993 labor rates. The $250,462.00 was not a single year increase; it was a two year increase. In FY 1996 the increase appears to be just as large as the 1995 increase. However it covers three years, 1994, 1995, and 1996; so, the average annual increase was much smaller. The rate of increase for each case was calculated by adding the DOL increase to the base year cost and then using the two point method for converting it to an average annual increase dependent on the elapsed time since the base year for the labor rates. The formula used is:

$$\text{Average Annual Increase} = ((\text{Base cost} + \text{DOL adjustment})/(\text{base cost}))^{(1/n)} - 1$$

Where 'n' is the number of years elapsed.

The overall weighted average was calculated by first averaging the increases for each year. For example 1994 has four rates that were averaged. Once all of the yearly

averages were calculated, an average of the averages was calculated. Although, the basic cost is calculated using a base year labor rate, the basic cost also includes procurement cost of repair parts. The rates of increase represent the increase in labor as a percent of the total cost. The contract manager said she estimates the increase at 5% each year for planning purposes. That agrees with the findings here. Figure 3-5 presents the contract data used for the calculations. The total increase shown in Figure 3-5 is the ending cost minus the beginning cost divided by the beginning cost. It is the total change in contract price as a percent of the base cost.

Simulator Maintenance Contract Data Effects of DOL Wage Determinations						
Year	93	94	95	96	97	Average
92	$ 1,937,161					
93	$ 2,086,837	$ 2,089,716	$1,606,948	$ 1,807,729	$ 1,208,192	7.73%
94		$ 2,169,827				5.08%
95			$1,857,410			5.50%
96				$ 2,058,191		4.50%
97					$ 1,418,230	4.57%
DOL Increase	$ 149,676	$ 80,111	$ 250,462	$ 250,462	$ 210,038	
Average Annual Escalation Rate						Weighted
Contract	7.73%	3.83%	7.51%	4.42%	4.57%	5.48%
Public	2.92%	2.26%	2.22%	2.23%	2.11%	
Total increase = (ending value - beginning value)/(beginning value)						
Contractor	7.73%	3.83%	15.59%	13.86%	17.38%	
Public	2.92%	2.26%	4.49%	6.83%	8.70%	

Figure 3-5

Figure 3-6 represents what would happen if this inflation differential continued over a period of twenty years. Again it is based on 25% savings in year zero. The graph is for illustration purposes. The starting dollar value for the contractor is the 1992 contract cost from Figure 3-5.

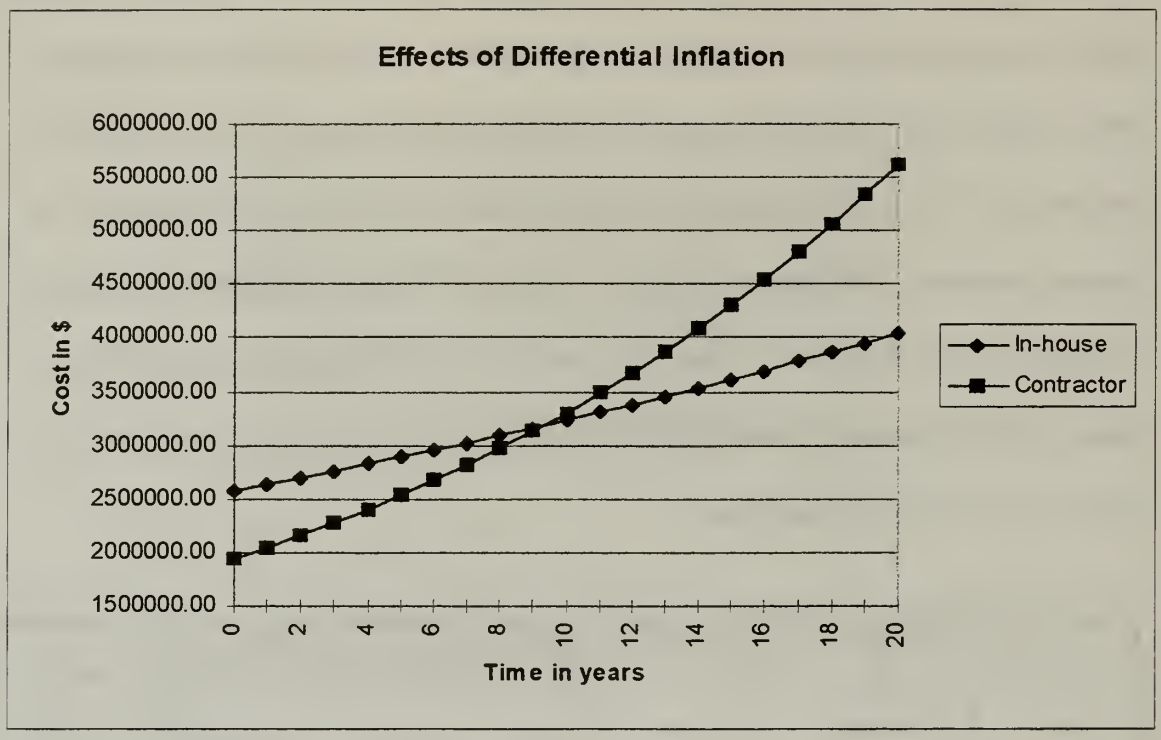

Figure 3-6

4. C-12 Maintenance Contract

The C-12 maintenance contract data used for this study are ideal for this purpose. Unfortunately it is only five years worth of data. Volume and cost data were provided for twelve line items. The volume for each line item remained constant from 1992 until 1996. The constant volume allows for an equitable unit cost comparison. In cases where volume changes significantly, fixed costs can cause unit costs to change abruptly. Eleven out of the twelve line items were usable for comparison. The "materials for logistics and maintenance support" line item was not used because materials that were purchased in the first two years of the contract were used in the later option years. The other eleven line

items **all** showed cost inflation rates greater than the in-house cost inflation rate from 1992 through 1996. The weighted average was computed by summing the unit cost times the expected annual volume and then calculating the average annual increase for the annual totals. Figure 3-7 shows each line item, its average annual increase, and the difference between the line item rate and the in-house rate. The line item total annual cost is provided to show how each line item contributed to the weighted average.

Figure 3-8 is provided for illustration purposes, C-12 maintenance has always been contracted out and no A-76 study was done. The starting contract cost is the actual contract from 1992. For many years prior to 1992 the contracts were sole source, with no competitive bids. Notice how much longer it takes to overcome the 25% initial savings.

C-12 Line Item Cost Escalation												
Year	Line 02	Line 05	Line 06	Line 07a	Line 07b	Line 08	Line 09	Line 10	Line 11	Line 12	Line 13	Annual
	Then Year Unit Cost Times Constant Annual Line Item Volume											Total
92	$11,356,824	$446,640	$1,043,964	$211,455	$60,080	$7,195,800	$249,840	$258,900	$58,060	$360,350	$52,980	$21,294,893
93	$12,094,308	$485,040	$1,087,110	$222,345	$63,180	$8,165,700	$260,040	$269,520	$60,340	$377,050	$58,080	$23,142,713
94	$12,649,992	$497,720	$1,175,634	$233,415	$66,340	$8,063,300	$273,360	$283,380	$63,060	$393,950	$60,000	$23,760,151
95	$13,210,692	$522,200	$1,230,552	$244,035	$69,510	$8,777,250	$286,920	$297,480	$65,900	$412,950	$63,320	$25,180,809
96	$13,937,196	$551,840	$1,296,540	$254,880	$72,830	$8,119,300	$302,400	$313,560	$69,340	$433,250	$67,560	$25,418,696
	Average Annual Escalation											
Avg ann	5.25%	5.43%	5.57%	4.78%	4.93%	3.06%	4.89%	4.91%	4.54%	4.71%	6.27%	4.52%
Diff DOD	2.85%	3.03%	3.17%	2.38%	2.53%	0.67%	2.49%	2.51%	2.14%	2.31%	3.87%	2.13%

Figure 3-7

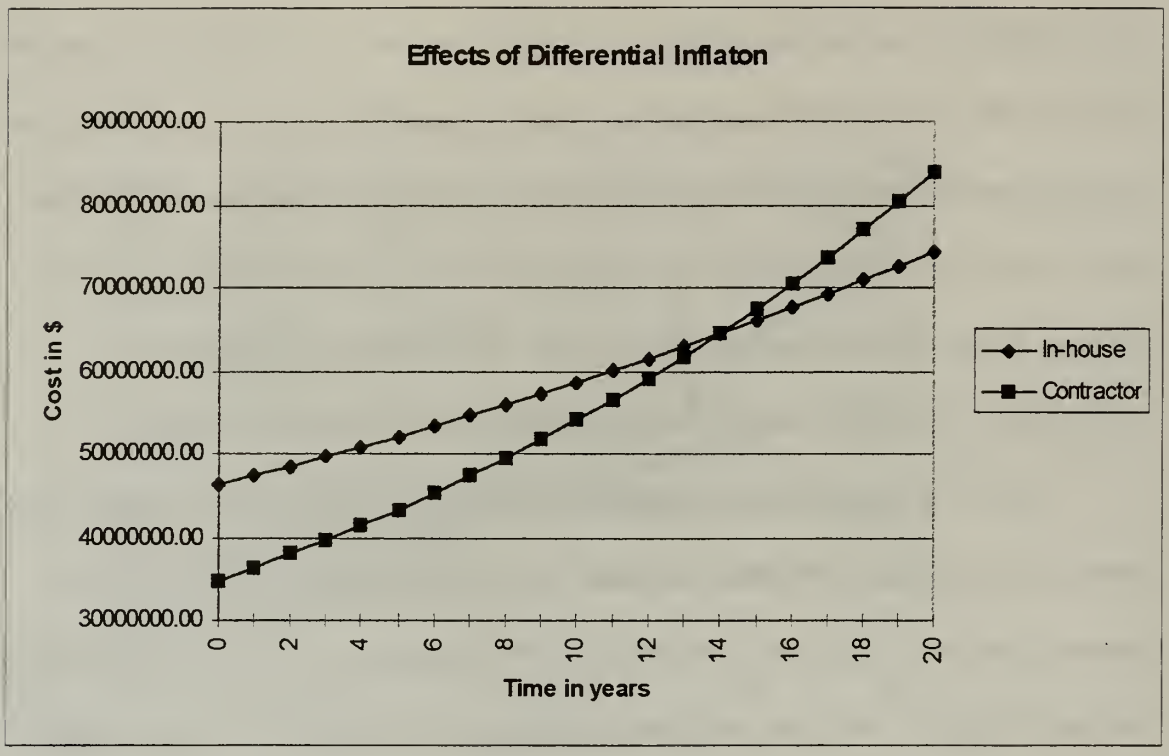

Figure 3-8

E. ANALYSIS

1. Overview

Any proper analysis of data must include some explanation concerning the applicability of the data. In this thesis all of the data are aviation related. While this may preclude direct comparison to the many other areas in which DOD oustources, the basic concepts are applicable to those other areas.

2. Contractors use Labor More Efficiently

Savings from outsourcing occur because the contractor makes more efficient use of his personnel. As stated earlier, outsourcing is merely contracting for services from outside suppliers instead of paying employees within the organization to provide the service. Government employees and military members are not on the top end of the pay scale; yet, outsourcing is able to achieve savings even though the contractor employees may be getting paid more. It is important to understand how this can be possible. To illustrate, we can use a generic example of aircraft organizational maintenance and apply some observations and personal experience from the C-12. When it comes to aircraft maintenance, DOD has very specific requirements to ensure the safety of the aircrew, passengers, and government property. These requirements apply also to contractors. The contractor must conform to all of the same periodic inspection, phase replacement, and quality assurance requirements as the military. The contractor is using the same replacement parts at the same price to the government. If the contractor's employees get paid more than DOD's employees, how can the contractor underbid the in-house cost? The answer is that the contractor uses fewer people to get the job done. The Military may have two or three shifts to ensure that maintenance people are available when necessary. The contractor can use flexible hours and have the workers come in only when there is work to be done. In the case of the C-12 at NAS Oceana, the contractor maintained the aircraft with only two employees. When the aircraft was scheduled to fly, one of them came in and performed the pre-flight preparations. After the C-12 departed, he went home. When the aircraft returned from flight, one of the maintainers was waiting to

perform the post flight maintenance and get the aircraft ready for the next event. If the aircraft was not broken, he went home. On occasion both maintainers had to work extra to get the aircraft fixed, but those occasions were few and far between. Rarely did they exceed a forty hour work week, because, unlike the military, if there was no work to do they went home. Additionally, both of the maintainers were qualified in all aircraft systems.

In DOD, personnel specialize in one, or maybe two areas. Military personnel also change jobs every few years, making it more difficult to be an expert on one type of aircraft. Thus, the contractor uses his personnel much more efficiently than the military does, so he can pay them more and still accomplish the job cheaper than DOD. **Notice that the major cost reduction is achieved through reduced personnel cost. This is true of most outsourcing cases,** even in the lease/charter cases, such as commercial transport aircraft. The contractor now owns the aircraft. He is not using low grade parts or cheaper fuel. The contractor is able to provide the service cheaper only by making more efficient use of his personnel.

3. Labor Rates Drive Service Contract Costs

The three contracts presented in this thesis are all part of the same industry segment. Labor rate inflation is a function of the industry segment or Standard Industrial Classification (SIC) in which the laborers work. The Department of Labor maintains hundreds of different wage determinations segregated by SIC and geographical region. The rates of increase for the different SICs and regions are not all equal. Figure 3-9 was

created using DOL survey data, published by the Bureau of Labor Statistics. [Ref 24]

Average Annual Employment Cost Inflation Rates							
Starting year to 1996	MPN	DOD Civilian	Aircraft Manufacturing Composite	Private Sector Composite	Professional Technical Specialty	Transportation Material Moving	Handlers Equipment Cleaning
1975	4.94%	4.42%	5.53%	NA	5.46%	4.44%	4.79%
1982	3.29%	3.16%	3.66%	3.99%	4.13%	2.78%	3.20%
1986	3.10%	3.25%	3.75%	3.77%	3.83%	2.66%	3.19%

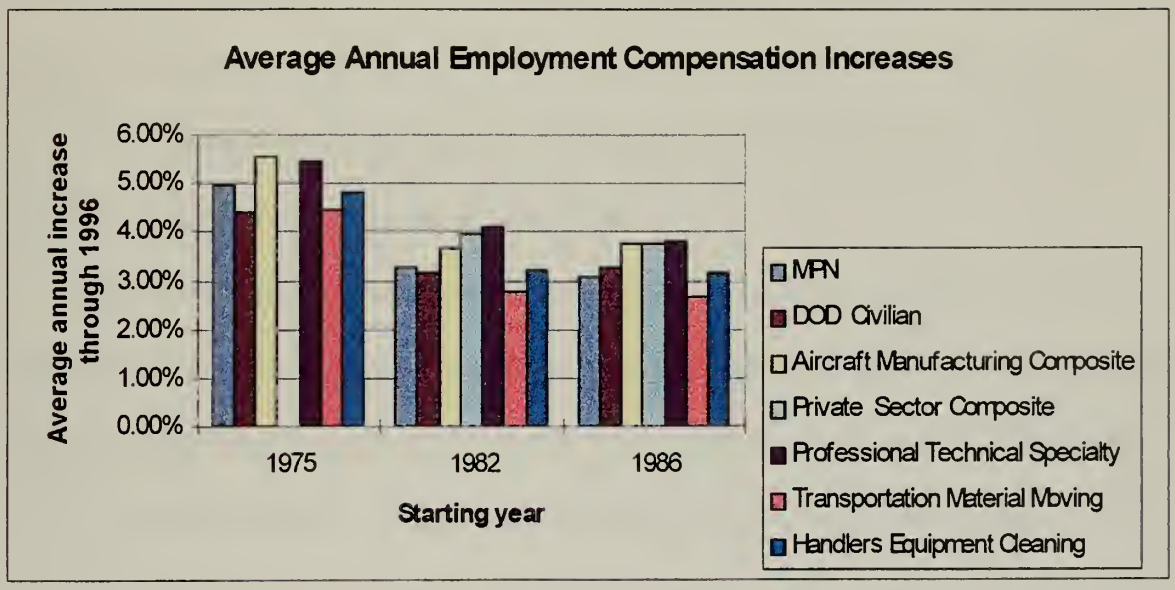

Figure 3-9

Notice that the Aircraft Industry and the Professional, Technical and Specialty sectors have a significantly higher rate of increase than the Military Personnel and DOD Civilian do. Conversely the Transportation, Material Moving and Equipment Cleaning sectors have somewhat lower rates of increase. The private sector as a whole is increasing just slightly faster than DOD. However, the data only goes back to 1980, so the indication is not as clear as it appears. If we compare three average annual rate increases from 1980

through 1996 we see that MPN = 4.56%, DOD Civilian = 3.65% and Private Sector Composite = 4.54%. Military Personnel and Private Sector employment costs increase at nearly the same rate.

The Service Contract Act of 1965 requires contractors to pay their employees at least the prevailing industry wage for the geographic region in which they are operating, so the service contract labor rates must increase as fast as the prevailing industry wage increases. In industries where the prevailing wage is increasing faster than the DOD wages, the contractor has three choices: 1) Raise the price. 2) Cut his profit margin. 3) Decrease the number of employees to save money.

The three contracts studied demonstrated that the contractor will chose to raise prices, especially when all of the competition must pay their employees the same rate. The simulator maintenance contract cost increases were all labor rate increases, as delineated by DOL wage determinations. The contract managers for the aircraft maintenance contracts both indicated that the cost increases in their respective contracts were the result of labor rate increases. The graph in Figure 3-10 shows the employment cost indices of the four aircraft SICs compared to the DOD aircraft maintenance composite employment cost index. All were started in 1975 at 100%. Looking at the trend for employment costs in the aircraft industry, it is logical that contract costs have risen faster than in-house cost. However, one must realize that the SICs used for this graph are not the exact same ones used for the contracts in this study. When asked to provide historical wage determination data for this study, officials at DOL declined. The data used are from the quarterly Employment Cost Index published by the Bureau of Labor Statistics. [Ref 25]

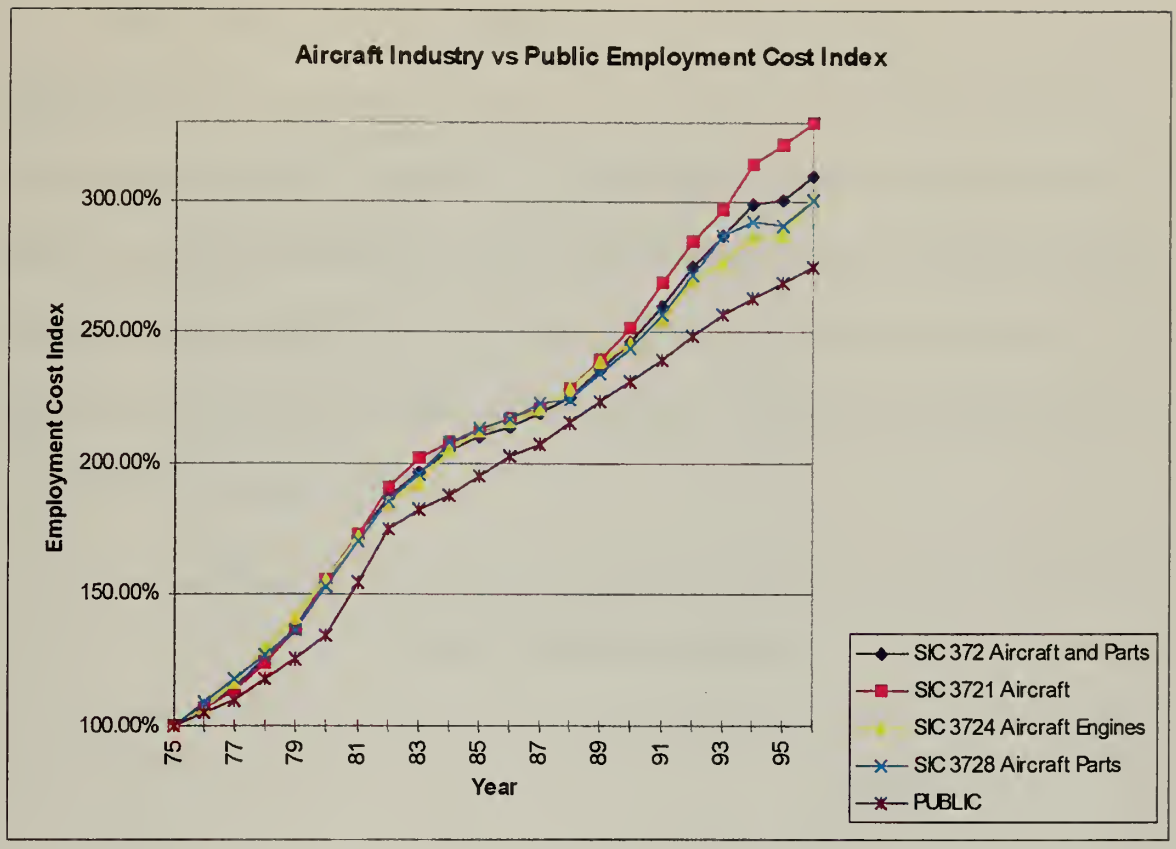

Figure 3-10

4. Outsourcing Criteria

Differential inflation between in-house and contract cost is important to consider when deciding whether or not to outsource a function currently being performed in-house, but not when deciding about functions not currently performed in-house. For new functions that require a substantial initial investment to perform in-house, the Government would be best served by delaying the investment until in-house performance becomes more economical. For in-house functions, switching to contract performance often requires significant transitional costs. Reducing infrastructure is neither free nor

instantaneous.

The contract data presented illustrated cases in which the contract cost increased significantly faster than comparable in-house costs. This fact alone is not an adequate rationale not to outsource . Recall the TH-57 maintenance contract data, which had the greatest contract cost escalation rate with the largest differential when compared to the in-house cost escalation rate. The graph in Figure 3-11 shows the same two lines as in Figure 3-4, but this time the initial saving is much larger. Notice that the lines do not cross until the twenty year point.

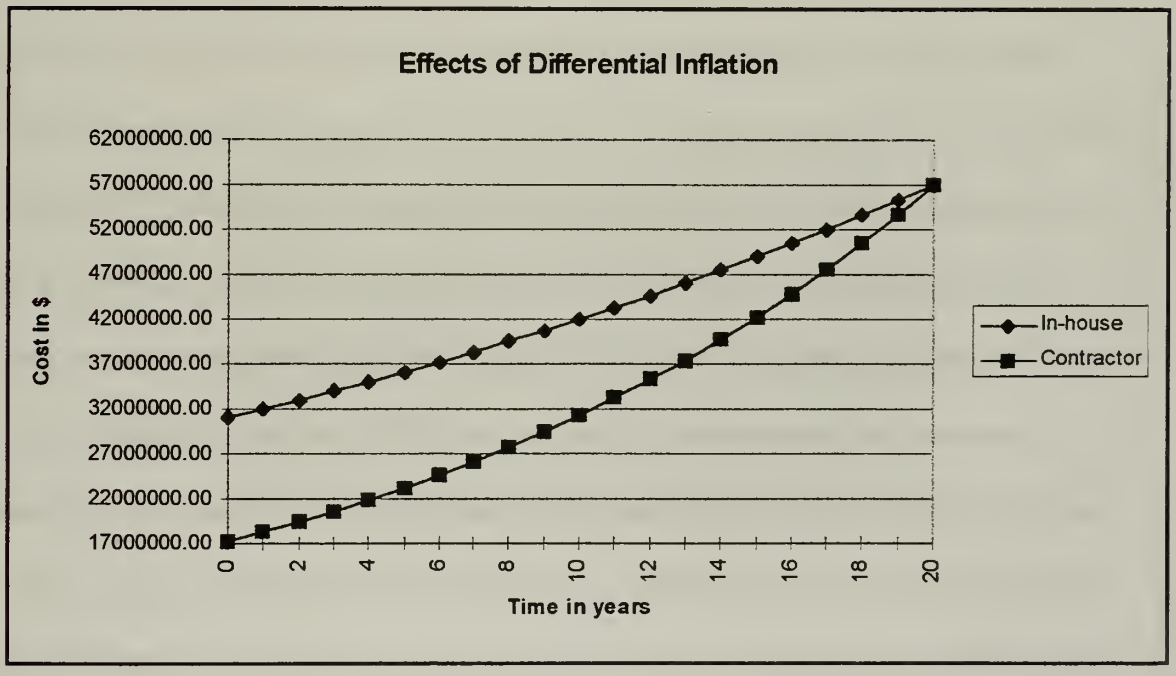

Figure 3-11

In this example the initial saving is nearly 45% of the in-house cost. Although these graphs present a clear picture of what would happen, the picture is not entirely accurate. Once the Government decides to outsource an in-house function, it does not

save money immediately. In fact the Government often loses money the first two or three years. The Government doesn't just fire people because a decision was made to outsource. People are offered early retirement, severance pay, transfers to another duty station; and the personnel who find themselves out of a job are eligible to collect unemployment compensation and continuing medical benefits. Reducing payrolls and eliminating infrastructure do lead to cost savings but it is clearly a long term proposition.

In cases where the contract cost does not escalate faster than the in-house cost, the decision to outsource or not is relatively straight forward. In cases like the ones in this study the decision is not as clear. If the Government is to achieve cost savings through outsourcing, the contract cost must remain below the in-house cost long enough to overcome any losses during the first few years. The table in Figure 3-12 was developed to help decision makers determine the initial savings required so that the total contract cost for all years equals the total in-house cost for all years over the expected project life. The costs starting with contract initiation through the end of the second year were not included in the calculations. Because of the time required for infrastructure and personnel reductions, and ease of calculation, the models assumes zero net cost reduction for the first two years. Although the net cost reduction throughout the project life will be zero, money is saved at the beginning of the project; and it is not paid back by the Government until some time in the future. The Government derives savings by not having to pay interest on the money. The model assumes a Government inflation rate of 3% in accordance with OMB Circular A-76 Transmittal Memorandum No. 17. [Ref 26]

Required Initial Savings (percent) to Break Even Over the Project Life							
Expected Life	Expected Contract Cost Escalation Rate						
Years	3.5% rate	4% rate	4.5% rate	5% rate	5.5% rate	6% rate	6.5% rate
	Required Initial Savings (percent)						
10	3.18	6.25	9.22	12.10	14.88	17.57	20.17
15	4.47	8.75	12.85	16.77	20.52	24.11	27.55
20	5.81	11.31	16.51	21.44	26.09	30.49	34.65
25	7.18	13.91	20.19	26.06	31.54	36.64	41.40
30	8.60	16.54	23.86	30.61	36.82	42.52	47.75
35	10.04	19.19	27.51	35.06	41.90	48.09	53.67

Figure 3-12

IV. IN-HOUSE COST ANALYSIS

A. INTRODUCTION

This chapter presents the total in-house cost to perform the Helicopter Combat Support mission aboard MSC ships. The annual unit cost and annual total cost have been calculated and are presented here. All calculations and costs are in FY 1997 dollars. The in-house cost can be converted to the appropriate fiscal year using DOD indices. Detailed calculations are presented in Appendix B. This chapter is divided into four remaining sections.

The Performance Work Statement section explains the requirements on which the cost analysis is based. Both the in-house and contract bids must be based on the same mission requirement.

The Most Efficient Organization section describes the Government's most efficient means of meeting the requirements presented in the performance work statement.

The Procurement section explains the analysis conducted to determine the procurement cost for the CH-60 and presents the expected procurement cost for the CH-60.

The In-House Cost Calculation section presents the calculations required to determine the total in-house cost. The in-house cost calculation was conducted in three parts. They are capital expenses, personnel expenses, and operating expenses.

B. PERFORMANCE WORK STATEMENT

This Performance Work Statement is based on fulfilling the HC requirements of the Military Sealift Command Combat Logistic Force as determined by the CNA study, "Analysis of HC Requirements for the Combat Logistic Force".[Ref 27] The current size and end strength of the HC community are based on the requirements necessary to support two Major Regional Conflicts, as directed by the Bottom Up Review and the Quadrennial Defense Review [Ref 28]. Among other requirements, the HC community must be able to support 14 detachments aboard Military Sealift Command CLF ships simultaneously. Each of these detachments currently requires two aircraft. The CNA study reduces this requirement to one aircraft per detachment on board the TAFSs, if the aircraft can lift 3.5 tons. Navy leaders are considering this recommendation. If accepted, this recommendation will result in a reduction of eight operational aircraft. Therefore, in this chapter the in-house cost is calculated for both scenarios. Remember that this requirement reduction is based on helicopters with a 3.5 ton lift capacity, so the replacements must also have this capacity. [Ref 29]

The total in-house cost is calculated for two separate requirements. The first requirement of 28 operational helicopters and four FRS helicopters will be referred to as option one. Option one supports 14 two-aircraft detachments. The second requirement of 20 operational helicopters and three FRS helicopters will be referred to as option two. Option two supports six two-aircraft detachments and eight one-aircraft detachments.

The peacetime HC requirement for MSC CLF ships is significantly less than the 28 or 20 required in times of conflict. The Center for Naval Analyses places the peacetime

requirements at 16 or 12 respectively [Ref 30]. The Navy must consider the contract cost to meet both the wartime requirements and peacetime requirements. However, the in-house operational requirements generate the FRS requirements. Therefore, the contractors will not be tasked with any FRS requirements. More information is presented in the following chapter on commercial alternatives.

C. MOST EFFICIENT ORGANIZATION

This analysis focusses on CH-60 operating costs instead of the CH-46D. This is done for the following reasons: 1) The CH-60 is replacing the CH-46. It is inappropriate to make a decision about long term savings to the Government based on an aircraft that will not be here in the long term. Replacement of all CH-46's will be completed by FY 2003 [Ref 31]. 2) After including the Government's cost of capital and depreciation, the CH-60 is significantly more expensive to operate than the CH-46. Basing the analysis on the higher and long term annual operating cost prevents the Government from overlooking a potential opportunity to save money through outsourcing. 3) The CH-60 is being procured for the HC community. Even with plans to outsource, the Navy will require 194 CH-60s. The Navy is planning on significant infrastructure reductions gained by reducing helicopter types, models, and series from eight down to two variations of the H-60. From a Navy-wide perspective the CH-60 is the most efficient choice of helicopter for in-house support of the MSC CLF ships.

The HH-60 only requires 11 maintenance man hours (mmh) per flight hour as compared to the CH-46, which requires 23 mmh per flight hour. Because of this reduced

work load, the Helicopter Combat Support Community Leaders are planning significant personnel reductions as CH-60s replace CH-46s. The detachment manning numbers used in this cost analysis were provided by Commander Helicopter Tactical Wing Pacific, [Ref 32]. These numbers are based on the detachment size of the HSL community minus the Anti-Submarime Warfare Aircrewmen (AW). The AWs operate the ASW equipment on board the SH-60s, but they do not maintain the aircraft. The aircrewmen in the HC community are also maintenance technicians, so some consolidation should be expected. The table in Figure 4-1 shows the detachment manning used for this in-house cost analysis. Both single aircraft and two-aircraft detachments are included. The two-aircraft detachment size is the same for both option one and option two.

MEO Perspective Detachment Manning

	Officers	Enlisted Personnel
One-aircraft Detachment	4	10
Two-aircraft Detachment	6	15

Figure 4-1

The reduction in the number of different types of aircraft will result in fewer personnel and a smaller infrastructure required for the Navy to provide intermediate and depot level maintenance support. These reductions will ultimately lead to reduced costs for these functions. However, calculating the new cost of these functions is beyond the scope of this thesis. Consequently costs will be based on the current intermediate and depot level manning and infrastructure.

D. PROCUREMENT

Procurement cost for the CH-60 is the single largest cost issue for this analysis. Procurement cost is needed to determine depreciation, cost of capital and insurance cost. Although the Federal Government is self insured, most contractors are not; so insurance costs must be included to ensure fair competition. Cost of capital savings are not directly reflected in DOD's budget, but the government does pay to borrow money and can avoid this interest by not procuring the CH-60's in question.

Before discussing the procurement cost of the CH-60, it is important review the current plan. Currently DON requires 194 CH-60's. If DON does not outsource the MSC mission, then the requirement is 226 or 217 CH-60s, depending on the requirement for two or one-aircraft per TAFS detachment. The procurement cost of the final 32 and the final 23 CH-60s must be estimated using the learning curve calculation.

1. Learning Curve Theory

> The now familiar term "learning curve" was first formalized by T.P.Wright [1936]. After observing aircraft production for some time, he found a constant decrease in the cumulative average production time as the cumulative number of aircraft produced doubles. By studying previous production records he was able to determine the rate of decrease in production times for similar kinds of aircraft. Determining the rate of decrease in production time made it possible for him to predict production times and delivery schedules for future aircraft with a high degree of accuracy. Since becoming formalized, the model has been used in a wide variety of industries. In the production process, when the variable production costs are observed to be declining in a systematic manner as the number of units produced increases, the process is said to be following the **learning curve** phenomenon.

The basic theory of the learning curve is simple: a worker learns as he

or she works; and the more often he repeats an operation, the more efficient he becomes, with the result that the direct labor input per unit declines. The factors that account for this increasing efficiency as cumulative output increases are numerous and cannot be completely attributed to production workers' learning. Those most commonly mentioned are:

1. job familiarization by workers as a result of repetition,

2. general improvement in shop organization and coordination,

3. development of more efficient parts-supply systems,

4. improvement in overall management.

Although there are several different terms, such as **experience curve, cost improvement curve, cost reduction curve, price reduction curve, performance improvement curve,** etc., and some of these terms are not true synonyms, the theory behind them is the same. That is, whenever the cumulative quantity of units produced doubles, the unit production cost or labor-hours declines by a constant percent.

Having discussed the basic premises underlying the learning curve, let us now proceed to an examination of specifics about what the curve is. In T. P. Wright's original formulation, he suggested that as the cumulative number of aircraft produced doubles, the *cumulative average cost* to produce them goes down at a constant rate. This theory is known as the ***cumulative average theory*** (a.k.a. ***Wright's Model)*** and was used widely in the aircraft industry for many years.

The standard learning curve formula used by Wright to formulate the decrease of cost at a constant rate, **r,** when the quantity is doubled:

$$y = ax^b$$

where:

a = the theoretical first unit cost, and

b = the learning curve exponent, measured as follows:

$$b = \log(r) / \log(2)$$

y = cumulative average costs (or hours) of each of the x cumulative units produced, and

x = the cumulative number of units produced. [Ref 33]

2. Assumptions and Basis for Analysis

The CH-60 negotiations will not be final until sometime after December 1997, so it is necessary to use historical procurement information to determine the learning rate. The CH-60 is a modification of the Army's UH-60L, so procurement data from the UH-60 will be analyzed. The graph in Figure 4-2 shows the UH-60 cumulative average cost versus total number procured, starting with the initial procurement in 1977.[Ref 34]

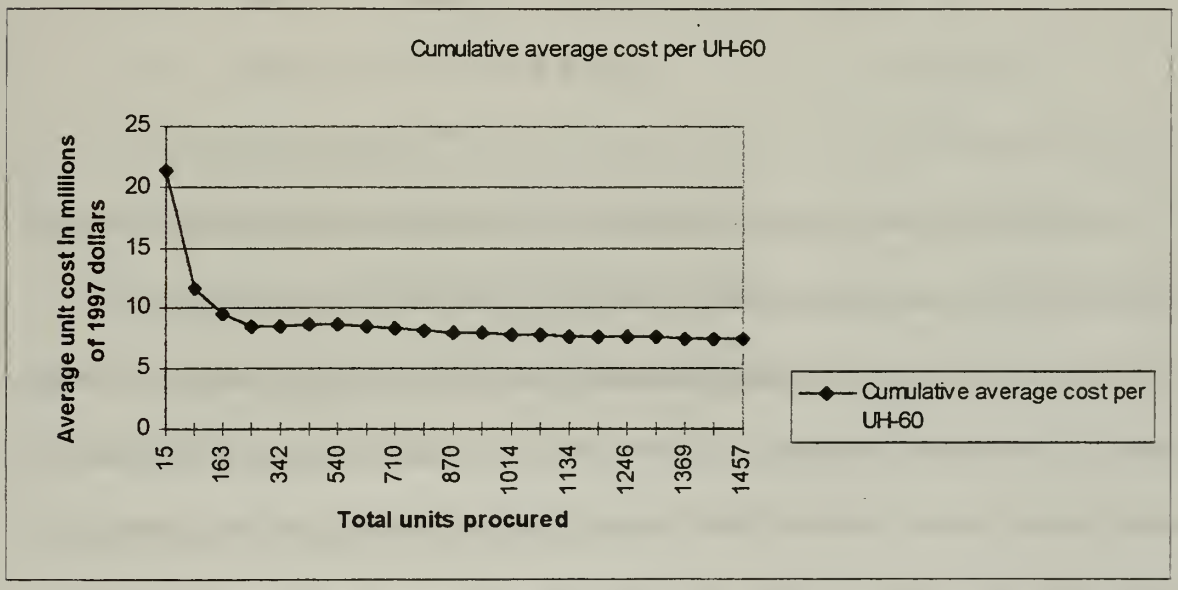

Figure 4-2

The graph shows a nearly perfect learning curve. The data can be used to determine the UH-60 learning rate and theoretical first unit cost by completing a linear regression of the log(y) against the log(x) . The results of the log log linear regression analysis presented in Figure 4-3 confirm the strength of the relationship. Note the adjusted R-squared value of

87.9%. This means that 87.9 percent of the variability in cumulative average cost (y) is explained by the number of units produced (x). Furthermore, both of the T-statistic values show a significance above the 99.9% probability.

Linear Regression Results

Predictor	Coef	StDev	T	P
Constant	10.2613	0.1014	101.22	0.000
Slope (b)	-0.18995	0.01574	-12.07	0.000

S = 0.08063 R-Sq = 88.5% R-Sq(adj) = 87.9%

Figure 4-3

The CH-60 is not an entirely new aircraft design. The basic airframe is an Army UH-60. However, many of the dynamic components are from the Navy's SH-60 or altogether new. The cargo handling system and the all electronic (glass) cockpit are new. Because of this unique composition of the CH-60, a unique learning curve is required. It would be inaccurate to start the UH-60 learning from the beginning, after 1457 UH-60s have been produced. However, the CH-60 initial units are more than twice the cost of a UH-60 and there are many new components making the CH-60 a new aircraft. To account for this unique problem the following assumptions were made: 1) The UH-60 learning curve will be used for the basic airframe cost, continuing from unit number 1457. 2) The cost of the modification, defined as the difference between the cost of the CH-60 less the cost of the UH-60, will start over on the learning curve using the same learning

rate as the UH-60. 3) The cost provided by the program office for the first 78 CH-60s is correct and was used to determine the cumulative average cost of the first 78 modifications [Ref 35].

3. Procurement Cost

Using these three assumptions the average unit cost of any number of CH-60s can be determined by summing the two separate learning curve calculations. Using the results presented in Figure 4-3 and the average cost of the first 78 CH-60s, the two learning curve equations are:

(1) $y1 = (28603.947)(x+1457)^{-0.18995}$ UH-60 cost

(2) $y2 = (17215.59)x^{-0.18995}$ Modification cost

where: y1+y2 = cumulative average unit cost of x units (in thousands of 1997 dollars).

The total cost can be calculated by multiplying the average unit cost (y1+y2) by the number of units (x). The total costs of 194, 217, and 226 CH-60s were determined and then the differences were taken to get the cost of the additional aircraft in accordance with the two possible requirements. The results are in Figure 4-4.

Cost of CH-60s in thousands of 1997 dollars			
Number of CH-60s	194	217	226
Total Cost of CH-60s	$ 2,341,115.74	$2,588,049.84	$2,683,933.38
Cost of CH-60s above 194	N/A	$ 246,934.09	$ 342,817.63

Figure 4-4

E. IN-HOUSE COST CALCULATION

The costs presented here are divided into three categories. 1. Capital costs include all of the costs incurred as a result of owning the aircraft–depreciation, insurance and cost of capital. 2. Operating expenses include the costs associated with operating the aircraft, except the organizational military personnel expenses. 3. Personnel expenses include all of the organizational military personnel costs, wages and fringe benefits.

1. Capital Expenses

a. Annual Depreciation

OMB Circular A-76 requires the use of straight line depreciation to determine annual depreciation expenses. Annual depreciation equals the asset acquisition cost less the residual value divided by the expected service life of the asset. The expected residual value is 2.48% of the acquisition cost, in accordance with A-76.[Ref 36]

The expected service life for the CH-60 was estimated by using the average age of the active helicopters in the HC community. Since all the helicopters used in the average are still active and not due to be replaced for 2 - 6 years, the average age is going to get even higher. However, the current age is acceptable for this analysis. The Commanders of Helicopter Tactical Wings Atlantic and Pacific had their staffs compile the data, and they determined the average age of the aircraft to be 32.7 years [Ref 37]. This calculation took place some months ago. Thirty three years will be used for the service life expectancy of the CH-60. However, the current inventory will average 35 years or more before it is retired.

b. Insurance Cost

According to OMB A-76, the Government must factor in insurance costs even though it is self insured [Ref 38]. The information required to calculate these insurance costs is available through the General Services Administration [Ref 39]. Both liability and collision insurance must be included in the calculations. For the H-60, the annual cost of collision insurance is 1.75% of the acquisition cost and the annual liability insurance is $ 6,000.00 plus $250.00 per seat in the aircraft.

c. Cost of Capital

The cost of capital accounts for the Government's interest on the debt which could be avoided if the asset in question was not purchased. The Government's cost of capital is equal to the interest rate paid on the thirty year Treasury bond for any asset with a service life of thirty years or longer. In this case the cost of capital was calculated at 6%.[Ref 40]

d. Total Annual Capital Expenses

Figure 4-5 and Figure 4-6 provide the capital expenses for the procurement of both 32 CH-60s and 23 CH-60s. Each annual expense is presented in total and per aircraft. All expenses are in 1997 dollars.

	Total	Per Aircraft
Procurement cost of 32 CH-60s	$ 342,817,634	$ 10,713,051
Salvage Value	$ 8,501,877	$ 265,684
Annual Depreciation cost	$ 10,130,781	$ 316,587
Annual Cost of Capital	$ 20,569,058	$ 642,783
Collision Insurance cost	$ 5,999,309	$ 187,478
Liability insurance cost	$ 328,000	$ 10,250
Total of annual capital costs	**$ 37,027,148**	**$ 1,157,098**

Figure 4-5

Capital Costs for Option One, 32 CH-60s

	Total	Per Aircraft
Procurement cost of 23 CH-60s	$ 246,934,092	$ 10,736,265
Salvage Value	$ 6,123,965	$ 266,259
Annual Depreciation cost	$ 7,297,277	$ 317,273
Annual Cost of Capital	$ 14,816,046	$ 644,176
Collision Insurance cost	$ 4,321,347	$ 187,885
Liability insurance cost	$ 235,750	$ 10,250
Total of annual capital costs	**$ 26,670,419**	**$ 1,159,583**

Figure 4-6

Capital Costs for Option Two, 23 CH-60s

2. Personnel Expenses

Military personnel expenses must be calculated using the Military Standard Composite Rates. The composite rates include basic pay, retired pay accrual, basic allowance for quarters, incentive pay, permanent change of station and miscellaneous

expense. A copy of the FY 1997 rates and breakdown is provided in Appendix B.[Ref 41]

The exact distribution of pay grades of the members of each detachment vary depending on availability. To deal with this variability, the Navy-wide weighted average is not used here. Rather a squadron-level HC community weighted average, which is more representative of the actual combination of pay grades available, is used. One weighted average was calculated for officers and another for enlisted personnel. The officer weighted average was slightly lower for the squadron as compared to the Navy-wide average, while the enlisted average was much higher for the squadron. This caused the total personnel costs to be higher when using the squadron-level weighted average.

The personnel costs would not be complete if the cost of flight training were omitted from the calculations. The flight training cost was provided by the Bureau of Naval Personnel via COMHELTACWINGPAC. The cost was amortized over the average career length for an aviator in the HC community. The total squadron level personnel costs are provided in Figure 4-7. The intermediate and depot level personnel costs are included in the operating expenses.[Ref 42]

	Total	Per aircraft
Option One Personnel Costs		
For 14 two aircraft detachments.	**$16,405,475**	$ 585,910
Option Two Personnel Costs		
For 8 one aircraft detachments	$ 6,249,705	$ 781,213
For 6 two aircraft detachments	$ 7,030,918	$ 585,910
Total Squadron Personnel costs	**$13,280,623**	

Figure 4-7

Total Annual Squadron Personnel Costs

3. Operating Costs

Operating costs for multi-engine state-of-the-art military helicopters are difficult to calculate. The Navy Center for Cost Analysis (NCCA) maintains the Navy's Visibility And Management of Operating and Support Costs (VAMOSC) program. The VAMOSC data base is the most complete data base available for the purpose of determining Navy operating costs.

Aircraft data is available by type, model and series from NCCA. The data base has data starting from 1987. The Navy did not start operating HH-60's until 1989. The HH-60 is the most comparable helicopter to CH-60 that the Navy has, so it will be used to predict the CH-60 operating costs. The VAMOSC data for the HH-60 is provided in Appendix B. The data has been escalated to FY 1997 dollars by NCCA.

The NCCA is tasked with capturing all of the operating costs in the VAMOSC data base. The data base contains over 60 fields per aircraft per year. The costs are organized and grouped logically. However, fixed costs are not separated from variable costs. Therefore, the in-house cost calculated here will overstate the savings gained by discontinuing in-house operations.[Ref 43]

Operating cost per flight hour and annual flight hours per aircraft are all that are required to determine expected annual operating cost per aircraft. Linear regression of total cost versus flight hours was the first method attempted in an effort to identify fixed costs. The regression results proved unreliable, yielding a large negative fixed cost component. Since the regression was unreliable, an average cost per flight hour was calculated by first summing all the costs for all years and then dividing by the total flight

hours for all years. Additionally, this procedure was repeated after excluding the squadron military personnel costs, which were calculated separately, based on the Government MEO. The average annual flight hours per aircraft (utilization rate) was calculated based on the data for the CH-46D, since the hours required to perform the HC mission are relevant to the case.

The operating costs captured in the VAMOSC data base do contain personnel costs for the squadron, intermediate, and depot maintenance levels. These personnel costs are calculated using the Standard Military Composite rates and the appropriate civilian rates for the DOD civilians [Ref 44]. The operating costs for the operational aircraft include all personnel costs except the squadron military personnel. The Fleet Replacement Squadron (FRS) aircraft operating costs do include the squadron military personnel costs. The total operating costs are presented in Figure 4-8.

Annual Operating Costs Option One 32 CH-60s		
	total	Per aircraft
Annual Operating cost Operational	$ 21,019,462	$ 750,695
Annual Operating cost FRS	$ 6,085,654	$ 1,521,413
Total Annual Operating Costs	**$ 27,105,116**	
Annual Operating Costs Option Two 23 CH-60s		
	Total	Per aircraft
Annual Operating costs operational	$ 15,013,901	$ 750,695
Annual Operating costs FRS	$ 4,564,240	$ 1,521,413
Total Annual Operating Costs	**$ 19,578,142**	

Figure 4-8

Annual Operating Costs

4. Total In-House Costs

a. Option One

The table in Figure 4-9 presents the total and unit in-house costs for option one. Option one in-house performance requires 28 operational helicopters and 4 FRS helicopters. The unit in-house cost is based on 28 commercial helicopters to replace 32 CH-60s and meet the operational wartime requirements.

	Total	Per Aircraft
Total of annual capital costs	$37,027,147	$ 1,157,098
Organizational Personnel costs		
For 14 two aircraft detachments	$16,405,475	$ 585,910
Annual Operating cost		
For 14 two aircraft detachments	$21,019,462	$ 750,695
Four FRS Aircraft	$ 6,085,654	$ 1,521,413
Operational aircraft		
CH-60 total annual cost	$69,823,691	$ 2,493,703
FRS aircraft		
CH-60 total annual cost	$10,714,047	$ 2,678,512
Total In-House cost of the HC MSC mission	$80,537,738	$ 2,876,348

Figure 4-9

In-House Cost for Option One

b. Option Two

The table in Figure 4-10 presents the total and unit in-house costs for option two. Option two in-house performance requires 20 operational helicopters and 3 FRS helicopters. The unit in-house cost is based on 20 commercial helicopters to replace 23 CH-60s and meet the operational wartime requirements.

	Total	Per Aircraft
Total of annual capital costs	$ 26,670,419	$ 1,159,583
Organizational Personnel costs		
For 6 two aircraft and 8 one aircraft Detachments	$ 13,280,623	
Annual operating costs		
For 6 two aircraft and 8 one aircraft Detachments	$ 15,013,901	$ 750,695
For 3 FRS aircraft	$ 4,564,240	$ 1,521,413
Operational aircraft		
CH-60 total annual cost	$ 51,486,193	$ 2,574,310
FRS aircraft		
CH-60 total annual cost/aircraft	$ 8,042,990	$ 2,680,997
Total In-House cost of the HC MSC mission	$ 59,529,183	$ 2,976,459

Figure 4-10

In-House Cost for Option Two

V. COMMERCIAL ALTERNATIVES

A. INTRODUCTION

The purpose of this chapter is to examine the feasibility of outsourcing the HC mission on board the Military Sealift Command (MSC) Combat Logistics Force (CLF) ships and to establish criteria to evaluate the possible commercial alternatives.

Three Advanced Concept Technology Demonstrations (ACTD) have been completed in an attempt to determine the feasibility and limitations of commercial helicopter alternatives. These ACTDs have generated many reports and discussions about the feasibility and minimum requirements of commercial alternatives. After-action reports from the first two demonstrations have been made available, including a Center for Naval Analyses study. To date, no after-action reports from the third study have been provided. Limited information about the third demonstration has been obtained through conversations with persons working for N88 and COMHELTACWINGPAC.

The first two demonstrations were both conducted using the Kaman Corporation as the prime contractor, flying the K-max helicopter. The third demonstration contract was awarded to Evergreen Corporation, flying the UH-1. The first demonstration was approximately two months long; the second lasted for a full six month deployment. The third demonstration was scheduled to complete a six month deployment as well, but it ended early. The official reason for the early end has not yet been made available. The primary purpose of the demonstrations was to study the concept of commercial helicopter logistics at sea; evaluating the specific aircraft and contractors was a secondary objective.

This chapter is presented in two sections, a discussion of the feasibility followed by

the evaluation criteria for the commercial alternatives.

B. FEASIBILITY

The after-action reports from the different sources present opposing opinions on suitability of K-max to perform the required mission. However, all of the reports agree that the concept of commercial VERTREP is plausible. The K-max helicopter has specific limitations which do not apply to all commercial helicopters, but these limitations required the elimination of 13 out of 35 scheduled test events for the first ACTD. The K-max is not certified for night operations or Instrument Flight Rules. Furthermore, it cannot carry passengers and has an extremely small internal cargo capacity of .9 cubic yards. These limitations led to K-max being excluded from bidding for the third demonstration.

The third demonstration was required to evaluate the Critical Operational Issues (COI) for which K-max was not capable of performing. As previously stated, the after-action reports are not yet available from the third demonstration. Although some of the verbal information received concerning the third demonstration was less than favorable, the criticism was directed at the contractor, not the concept. From all of the information received to date concerning the third demonstration, the concept of commercial VERTREP is valid.

The Commander in Chief, U.S. Pacific Fleet after-action report reached the following conclusions:

a. The Commercial VERTREP Helicopter concept is operationally suitable.

b. The Commercial VERTREP Helicopter concept is operationally

effective.

However, the following recommendation was also included in the report:

> c. Do not contract to deploy any additional detachments in support of the Commercial VERTREP Helo Program until completion of the LANTFLT operational evaluation in USNS SATURN. The LANTFLT operational evaluation will provide resolution of COI's that will document the capability requirements for helicopters embarked in T-AFS's operating in a different AOR[area of responsibility].[Ref 45]

The after-action and CNA reports for the first demonstration state similar conclusions. Therefore, in the absence of any information to the contrary, it is concluded that using a commercial alternative to provide Helicopter Combat Support from MSC CLF ships is operationally feasible.

C. COMMERCIAL ALTERNATIVE EVALUATION

Different commercial alternatives (different helicopter models) will have different capabilities and limitations. Comparing commercial alternatives to each other and to the in-house alternative will require economic adjustments for the differing capabilities. Quantifying these differences may be subjective in some cases. However, it is still necessary if an equitable comparison is to be made.

One may be inclined to think that a well defined Mission Needs Statement (MNS) could reduce the variation of capabilities between qualified bidders and the in-house bid. The Navy does have a well defined MNS. However, alternatives which fail to comply with the MNS are still being considered as possible alternatives by high level decision makers. Consider the following two statements, one from the Deputy Chief of Naval

Operations Logistics and the other from CINCPACFLT.

> I realize Kmax, or a comparable alternative, will not perform all current HC missions, but the cost savings would seem to be significant enough to justify finding alternate solutions for those other missions.[Ref 46]
>
> Navy must make a decision on the USN requirement for night VERTREP operations. Decision should be made with knowledge of resource costs/savings associated with options. Once this decision made, the K-Max aircraft may be a candidate for further Commercial Helicopter contracts.[Ref 47]

These statements demonstrate that the mission needs statement may be redefined if the potential cost savings are significant enough. To consider every possible alternative in advance is not possible, so the goal for the reminder of this chapter is to establish some general guide lines and considerations for some of the different alternatives already being considered.

1. Surge Capacity

The current National Strategy requires that the HC Community support six TAEs and eight TAFSs. This requires 28 operational helicopters and four FRS helicopters. However, more often than not these helicopters will only be used to support eight CLF ships. This excess capacity allows the Navy to meet personnel tempo requirements. The excess capacity also gives the appearance of inefficiency and an opportunity to save money. Proponents of this issue have proposed savings through the replacement of 28 operational and four FRS helicopters with 16 contract helicopters, failing to include the cost of a surge capacity. The job of the Navy is to be ready for war and any cost comparison must include the cost of a surge capacity. Consider these options to account for surge capacity. 1) Use a separate contract for the remaining 12 helicopters, with all

the required personnel in a standby status to be called when needed. The contractor would be responsible to ensure the aircraft and personnel were prepared for the mission. Once called, the contractor would be paid a use rate above and beyond the standby rates. To calculate the true cost of this option the expected probability of use for the standby helicopters must be accurately estimated. The cost to the Government and the revenue for the contractor will change as a function of world contingencies. 2) Pay the prime contractor for 28 helicopters even though the plan is to use only those helicopters necessary to support eight MSC ships. If world contingencies require the mobilization of additional MSC ships, then the contractor must provide additional helicopters, up to the 28 helicopter total. In this case the cost to the Government and the revenue to the contractor are **not** functions of world contingencies. If the contractors know they can perform the mission using 16 helicopters and will only be required to provide additional helicopters as needed, they will estimate the expected probability of use for the standby helicopters and bid accordingly. In both cases, permitting the contractors to use the helicopters to provide commercial services while in standby status for the Navy should reduce the cost of the contract, since the contractor is not forgoing the opportunity of providing commercial services. Whichever option is chosen, the cost of the surge capacity must be included in the total contract cost before comparing the contract cost to the total in-house cost.

2. Cost Adjustments for Reduced Capabilities

Proponents of the K-max helicopter as the alternative to the in-house performance are comparing the contract and in-house costs directly. They are failing to account for the

different capabilities of the two different helicopters. The in-house operational costs are based on the average utilization rates for the HC aircraft; these utilization rates include flight time performing missions that K-max is not capable of performing. The supporters claim that enough excess capacity is available in the remainder of the fleet helicopters to provide for the lost capabilities. The CNA study of HC requirements contradicts this claim; however, for argument purposes, assume the excess capacity does exist. Using other Navy helicopters to perform missions K-max is not capable of costs the Navy money. Since excess capacity is assumed, then the additional cost to the Navy is the marginal operating cost for the other helicopters to perform the HC missions. The HH-60 has the lowest marginal operating cost of the fleet helicopters. It costs $1707 per hour. This operating cost was obtained by subtracting squadron personnel cost from total cost and dividing by total flight time (all the data comes from the VAMOSC data base). The annual utilization rate for an operational HC helicopter is 440 hours per year. This was calculated by dividing total annual flight hours by the number of aircraft. Of the 440 hours, approximately 31 percent are training hours. This leaves 304 mission hours. This was calculated from Training Mission Requirement codes (TMR). These codes distinguish between training flights and many other mission types. The training hours were divided by the total flight hours for the operational squadrons. Of those mission hours CNA states that 31 percent are for internal cargo and passengers and the remaining 69 percent are for external cargo operations. Additionally, 25 percent of the external hours are flown at night. The night percentage was determined by totaling HC-5s MSC detachment flight hours (day, night and total) from 1990 through the summer of 1997.

The night hours were divided by the total hours. The total mission hours that must be flown by in-house aircraft to compensate for the Kmax is 147 hours per aircraft per year. These 147 hours will cost the Navy an additional $250,929 per aircraft per year. This cost represents the marginal cost, assuming excess capacity exists; the cost will increase significantly if excess capacity does not exist. These additional costs are incurred because the K-max is unable to perform certain missions; therefore, it is inappropriate to disregard these costs when comparing K-max to aircraft that are capable of performing all missions.

All commercial alternatives are not equal, so the only equitable way to compare them to each other and the CH-60 is to adjust each bid based on the flight time requirements of the missions for which the aircraft is not capable. These cost adjustments cannot account for the intrinsic value of having a more capable aircraft at the disposal of the Fleet Commanders.

3. One Aircraft TAFS Detachments

The Navy is considering placing only one aircraft on TAFSs based on a recommendation by CNA. However, this reduction in aircraft is recommended only for aircraft with a 3.5 ton lift capacity. If the Navy accepts this recommendation, then only one CH-60 per TAFS will be required for in-house performance. If the proposed contract aircraft cannot lift 3.5 tons, then two contract aircraft must be used to replace one CH-60. The decision concerning the TAFSs should be made prior to completing the final cost comparison.

VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The analysis in Chapter III demonstrated that service contract costs often escalate at substantially different rates than in-house costs. All three of the contracts studied in Chapter III escalated substantially faster than the comparable in-house costs. This escalation rate differential reduces long term savings and can ultimately lead to increased costs to the Government. Chapter III also demonstrated that employment costs in some Standard Industrial Classifications escalate much quicker than in-house employment costs, while some SICs escalate much slower. Finally Chapter III presents a model to deal with differential escalation rates by ensuring the initial savings is great enough to compensate for the differential.

Chapter IV presents the total in-house cost for two different options to support the HC MSC mission. Option one has a total cost of $80,537,738 for 28 operational aircraft. Option two has a total cost of $59,529,183 for 20 operational aircraft.

Chapter V presents evidence showing that commercial alternatives are capable of fulfilling the HC mission in question. However, the chapter also demonstrated that less capable alternatives can dramatically increase the true contract cost to the Government.

B. CONCLUSIONS AND RECOMMENDATIONS

The Government and specifically DOD should focus their outsourcing efforts on functions in which the expected contract escalation rate is at or below the expected in-house escalation rate. This can be accomplished by looking at SICs which have

historically low employment cost increase rates, like "Handlers, Equipment Cleaners, and Laborers" and Transportation, Material Moving presented in Chapter III. Furthermore, if outsourcing a function in which the expected contract cost escalation is higher than the expected in-house cost escalation rate, the data in Figure 3-12 can be used to determine the required amount of initial cost savings to avoid a long term loss to the Government.

Applying this logic to the HC outsourcing issue, one would first estimate the expected escalation rate by using historical data. From the data in Chapter III, the lowest annual contract cost escalation rate is 4.52 percent for the C-12 contract. Using this rate and a 35 year expected project life, the initial contract savings should equal 27.51 percent of the Navy's in-house cost. This equates to a bid of $58,381,806 for option one or $43,152,705 for option two. Labor rate data for the appropriate SIC's should be available from the Department of Labor and should be used to estimate the contract cost escalation rate. The Department of Labor would not provide this data for this thesis.

If DON does not outsource this mission, it should test option two to ensure it provides adequate service to the fleet. Option two costs 26 percent less than option one. This equates to an annual savings of $21,008,555. DON cannot afford to overlook an opportunity of this magnitude.

Form DD350 should be modified to include contract volume and unit price information as well as the previous and follow-on contract numbers. This modification would enhance the value of the DOD contract data maintained at the Federal Data Center, making it easier to determine contract cost escalation rates.

APPENDIX A. COST INDICES

This appendix contains the data and calculations referred to in Chapter Three of this thesis. Calculations and data contained in Chapter III are not repeated here. The data which are only summarized in Chapter III are presented here.

Professional, Technical, and Specialty Composite Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	42.40%	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	45.00%	106.13%	43.67%	108.25%	38.27%	105.34%	105.34%	6.13%	5.34%	0.79%			
77	48.10%	113.44%	46.20%	114.53%	39.97%	110.02%	110.03%	6.89%	4.44%	2.44%			
78	51.30%	120.99%	49.78%	123.40%	42.77%	117.73%	117.73%	6.65%	7.01%	(0.35%)			
79	55.20%	130.19%	52.78%	130.84%	45.51%	125.27%	125.28%	7.60%	6.41%	1.20%			
80	61.80%	145.75%	56.39%	139.79%	48.99%	134.85%	134.85%	11.96%	7.65%	4.31%	45.75%	34.85%	10.90%
81	67.90%	160.14%	61.30%	151.96%	56.36%	155.13%	155.13%	9.87%	15.04%	(5.16%)	50.89%	47.26%	3.63%
82	73.50%	173.35%	64.66%	160.29%	63.60%	175.06%	175.04%	8.25%	12.84%	(4.59%)	52.81%	59.09%	(6.29%)
83	78.80%	185.85%	67.45%	167.20%	66.24%	182.35%	182.31%	7.21%	4.15%	3.06%	53.61%	54.85%	(1.24%)
84	82.30%	194.10%	69.48%	172.24%	68.30%	188.00%	187.98%	4.44%	3.11%	1.33%	49.09%	50.05%	(0.96%)
85	86.30%	203.54%	71.99%	178.46%	70.97%	195.35%	195.33%	4.86%	3.91%	0.95%	39.64%	44.84%	(5.20%)
86	89.00%	209.91%	72.61%	180.00%	73.71%	202.89%	202.86%	3.13%	3.86%	(0.73%)	31.08%	30.77%	0.31%
87	92.80%	218.87%	74.24%	184.04%	75.42%	207.60%	207.57%	4.27%	2.32%	1.95%	26.26%	18.58%	7.68%
88	97.40%	229.72%	75.91%	188.18%	78.53%	216.16%	216.12%	4.96%	4.12%	0.84%	23.60%	18.55%	5.06%
89	101.60%	239.62%	78.63%	194.92%	81.34%	223.89%	223.85%	4.31%	3.58%	0.73%	23.45%	19.09%	4.37%
90	106.50%	251.18%	81.55%	202.16%	84.19%	231.74%	231.70%	4.82%	3.50%	1.32%	23.41%	18.62%	4.79%
91	111.10%	262.03%	84.80%	210.21%	87.06%	239.64%	239.60%	4.32%	3.41%	0.91%	24.83%	18.11%	6.72%
92	115.30%	271.93%	88.34%	218.99%	90.34%	248.67%	248.63%	3.78%	3.77%	0.01%	24.25%	19.78%	4.46%
93	118.90%	280.42%	91.71%	227.34%	93.46%	257.25%	257.21%	3.12%	3.45%	(0.33%)	22.07%	19.01%	3.06%
94	122.20%	288.21%	94.70%	234.75%	95.70%	263.42%	263.38%	2.78%	2.40%	0.38%	20.28%	17.66%	2.62%
95	125.30%	295.52%	97.53%	241.77%	97.81%	269.23%	269.19%	2.54%	2.21%	0.33%	17.65%	16.18%	1.47%
96	129.60%	305.66%	100.00%	247.89%	100.00%	275.25%	275.22%	3.43%	2.24%	1.19%	16.65%	14.87%	1.78%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		5.46%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		4.13%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.83%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							
			weights based on VAMOSC data DOD civilian and military personnel costs										

Private Industry Composite Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75		0.00%	40.34%	71.54%	36.33%	74.16%	74.15%						
76		0.00%	43.67%	77.44%	38.27%	78.12%	78.12%	N/A	5.34%	N/A			
77		0.00%	46.20%	81.93%	39.97%	81.59%	81.59%	N/A	4.44%	N/A			
78		0.00%	49.78%	88.28%	42.77%	87.30%	87.30%	N/A	7.01%	N/A			
79		0.00%	52.78%	93.60%	45.51%	92.90%	92.90%	N/A	6.41%	N/A			
80	63.70%	100.00%	56.39%	100.00%	48.99%	100.00%	100.00%	N/A	7.65%	N/A	N/A	34.85%	N/A
81	70.00%	109.89%	61.30%	108.71%	56.36%	115.04%	115.04%	9.89%	15.04%	(5.15%)	N/A	47.26%	N/A
82	75.00%	117.74%	64.66%	114.67%	63.60%	129.82%	129.80%	7.14%	12.84%	(5.69%)	N/A	59.09%	N/A
83	79.20%	124.33%	67.45%	119.61%	66.24%	135.21%	135.19%	5.60%	4.15%	1.45%	N/A	54.85%	N/A
84	83.00%	130.30%	69.48%	123.21%	68.30%	139.42%	139.40%	4.80%	3.11%	1.69%	N/A	50.05%	N/A
85	86.90%	136.42%	71.99%	127.66%	70.97%	144.87%	144.84%	4.70%	3.91%	0.79%	36.42%	44.84%	(8.42%)
86	89.60%	140.66%	72.61%	128.76%	73.71%	150.46%	150.43%	3.11%	3.86%	(0.75%)	28.00%	30.77%	(2.77%)
87	92.50%	145.21%	74.24%	131.65%	75.42%	153.95%	153.92%	3.24%	2.32%	0.92%	23.33%	18.58%	4.75%
88	96.60%	151.65%	75.91%	134.62%	78.53%	160.30%	160.26%	4.43%	4.12%	0.31%	21.97%	18.55%	3.42%
89	101.20%	158.87%	78.63%	139.44%	81.34%	166.03%	166.00%	4.76%	3.58%	1.18%	21.93%	19.09%	2.84%
90	106.20%	166.72%	81.55%	144.62%	84.19%	171.85%	171.82%	4.94%	3.50%	1.44%	22.21%	18.62%	3.59%
91	110.90%	174.10%	84.80%	150.38%	87.06%	177.71%	177.67%	4.43%	3.41%	1.02%	23.77%	18.11%	5.66%
92	114.70%	180.06%	88.34%	156.66%	90.34%	184.40%	184.37%	3.43%	3.77%	(0.34%)	24.00%	19.78%	4.22%
93	118.90%	186.66%	91.71%	162.64%	93.46%	190.77%	190.74%	3.66%	3.45%	0.21%	23.08%	19.01%	4.07%
94	122.80%	192.78%	94.70%	167.94%	95.70%	195.35%	195.31%	3.28%	2.40%	0.88%	21.34%	17.66%	3.69%
95	126.00%	197.80%	97.53%	172.96%	97.81%	199.65%	199.62%	2.61%	2.21%	0.40%	18.64%	16.18%	2.46%
96	129.70%	203.61%	100.00%	177.34%	100.00%	204.12%	204.09%	2.94%	2.24%	0.70%	16.95%	14.87%	2.09%
97		0.00%	102.80%	182.30%	102.72%	209.68%	209.64%						
annual inflation rate 80 -		4.54%		3.65%		4.56%	4.56%						
annual inflation rate 82 -		3.99%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.77%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Handlers, Equipment Cleaners, & Laborers Composite Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	47.10%	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	50.80%	107.86%	43.67%	108.25%	38.27%	105.34%	105.34%	7.86%	5.34%	2.51%			
77	55.20%	117.20%	46.20%	114.53%	39.97%	110.02%	110.03%	8.66%	4.44%	4.22%			
78	59.50%	126.33%	49.78%	123.40%	42.77%	117.73%	117.73%	7.79%	7.01%	0.78%			
79	64.50%	136.94%	52.78%	130.84%	45.51%	125.27%	125.28%	8.40%	6.41%	2.00%			
80	71.40%	151.59%	56.39%	139.79%	48.99%	134.85%	134.85%	10.70%	7.65%	3.05%	51.59%	34.85%	16.74%
81	77.10%	163.69%	61.30%	151.96%	56.36%	155.13%	155.13%	7.98%	15.04%	(7.05%)	51.77%	47.26%	4.51%
82	80.90%	171.76%	64.66%	160.29%	63.60%	175.06%	175.04%	4.93%	12.84%	(7.91%)	46.56%	59.09%	(12.54%)
83	84.20%	178.77%	67.45%	167.20%	66.24%	182.33%	182.31%	4.08%	4.15%	(0.07%)	41.51%	54.85%	(13.34%)
84	87.20%	185.14%	69.48%	172.24%	68.30%	188.00%	187.98%	3.56%	3.11%	0.45%	35.19%	50.05%	(14.86%)
85	90.10%	191.30%	71.99%	178.46%	70.97%	195.35%	195.33%	3.33%	3.91%	(0.58%)	26.19%	44.84%	(18.65%)
86	91.90%	195.12%	72.61%	180.00%	73.71%	202.89%	202.86%	2.00%	3.86%	(1.86%)	19.20%	30.77%	(11.57%)
87	94.00%	199.58%	74.24%	184.04%	75.42%	207.60%	207.57%	2.29%	2.32%	(0.03%)	16.19%	18.58%	(2.39%)
88	97.60%	207.22%	75.91%	188.18%	78.53%	216.16%	216.12%	3.83%	4.12%	(0.29%)	15.91%	18.55%	(2.63%)
89	101.10%	214.65%	78.63%	194.92%	81.34%	223.89%	223.85%	3.59%	3.58%	0.01%	15.94%	19.09%	(3.14%)
90	105.30%	223.57%	81.55%	202.16%	84.19%	231.74%	231.70%	4.15%	3.50%	0.65%	16.87%	18.62%	(1.75%)
91	109.20%	231.85%	84.80%	210.21%	87.06%	239.64%	239.60%	3.70%	3.41%	0.29%	18.82%	18.11%	0.71%
92	112.10%	238.00%	88.34%	218.99%	90.34%	248.67%	248.63%	2.66%	3.77%	(1.11%)	19.26%	19.78%	(0.53%)
93	114.90%	243.95%	91.71%	227.34%	93.46%	257.25%	257.21%	2.50%	3.45%	(0.96%)	17.73%	19.01%	(1.29%)
94	117.90%	250.32%	94.70%	234.75%	95.70%	263.42%	263.38%	2.61%	2.40%	0.21%	16.62%	17.66%	(1.04%)
95	121.50%	257.96%	97.53%	241.77%	97.81%	269.23%	269.19%	3.05%	2.21%	0.85%	15.38%	16.18%	(0.80%)
96	125.80%	267.09%	100.00%	247.89%	100.00%	275.25%	275.22%	3.54%	2.24%	1.30%	15.20%	14.87%	0.33%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		4.79%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		3.20%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.19%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Transportation and Materials Moving Composite Employment Cost Indices Compared to DOD Employment Cost Indices

Fiscal	Private Sector		OMN/GS WB		MPN		PUBLIC Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	48.60%	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	52.60%	108.23%	43.67%	108.25%	38.27%	105.34%	105.34%	8.23%	5.34%	2.89%			
77	56.30%	115.84%	46.20%	114.53%	39.97%	110.02%	110.03%	7.03%	4.44%	2.59%			
78	61.10%	125.72%	49.78%	123.40%	42.77%	117.73%	117.73%	8.53%	7.01%	1.52%			
79	66.80%	137.45%	52.78%	130.84%	45.51%	125.27%	125.28%	9.33%	6.41%	2.92%			
80	72.60%	149.38%	56.39%	139.79%	48.99%	134.85%	134.85%	8.68%	7.65%	1.04%	49.38%	34.85%	14.53%
81	78.50%	161.52%	61.30%	151.96%	56.36%	155.13%	155.13%	8.13%	15.04%	(6.91%)	49.24%	47.26%	1.98%
82	82.40%	169.55%	64.66%	160.29%	63.60%	175.06%	175.04%	4.97%	12.84%	(7.87%)	46.36%	59.09%	(12.73%)
83	86.00%	176.95%	67.45%	167.20%	66.24%	182.33%	182.31%	4.37%	4.15%	0.22%	40.75%	54.85%	(14.10%)
84	88.10%	181.28%	69.48%	172.24%	68.30%	188.00%	187.98%	2.44%	3.11%	(0.67%)	31.89%	50.05%	(18.17%)
85	91.50%	188.27%	71.99%	178.46%	70.97%	195.35%	195.33%	3.86%	3.91%	(0.05%)	26.03%	44.84%	(18.81%)
86	93.10%	191.56%	72.61%	180.00%	73.71%	202.89%	202.86%	1.75%	3.86%	(2.11%)	18.60%	30.77%	(12.17%)
87	95.00%	195.47%	74.24%	184.04%	75.42%	207.60%	207.57%	2.04%	2.32%	(0.28%)	15.29%	18.58%	(3.29%)
88	98.40%	202.47%	75.91%	188.18%	78.53%	216.16%	216.12%	3.58%	4.12%	(0.54%)	14.42%	18.55%	(4.13%)
89	101.20%	208.23%	78.63%	194.92%	81.34%	223.89%	223.85%	2.85%	3.58%	(0.73%)	14.87%	19.09%	(4.22%)
90	103.60%	213.17%	81.55%	202.16%	84.19%	231.74%	231.70%	2.37%	3.50%	(1.13%)	13.22%	18.62%	(5.40%)
91	106.10%	218.31%	84.80%	210.21%	87.06%	239.64%	239.60%	2.41%	3.41%	(1.00%)	13.96%	18.11%	(4.15%)
92	109.30%	224.90%	88.34%	218.99%	90.34%	248.67%	248.63%	3.02%	3.77%	(0.75%)	15.05%	19.78%	(4.73%)
93	111.70%	229.84%	91.71%	227.34%	93.46%	257.25%	257.21%	2.20%	3.45%	(1.26%)	13.52%	19.01%	(5.50%)
94	115.20%	237.04%	94.70%	234.75%	95.70%	263.42%	263.38%	3.13%	2.40%	0.74%	13.83%	17.66%	(3.82%)
95	118.50%	243.83%	97.53%	241.77%	97.81%	269.23%	269.19%	2.86%	2.21%	0.66%	14.38%	16.18%	(1.80%)
96	121.00%	248.97%	100.00%	247.89%	100.00%	275.25%	275.22%	2.11%	2.24%	(0.13%)	14.04%	14.87%	(0.82%)
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		4.44%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		2.78%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		2.66%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Standard Industrial Classification 372 Aircraft and Parts Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	6.00	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	6.44	107.33%	43.67%	108.25%	38.27%	105.34%	105.34%	7.33%	5.34%	1.99%			
77	6.92	115.33%	46.20%	114.53%	39.97%	110.02%	110.03%	7.45%	4.44%	3.01%			
78	7.54	125.67%	49.78%	123.40%	42.77%	117.73%	117.73%	8.96%	7.01%	1.95%			
79	8.26	137.67%	52.78%	130.84%	45.51%	125.27%	125.28%	9.55%	6.41%	3.14%			
80	9.28	154.67%	56.39%	139.79%	48.99%	134.85%	134.85%	12.35%	7.65%	4.70%	54.67%	34.85%	19.81%
81	10.31	171.83%	61.30%	151.96%	56.36%	155.13%	155.13%	11.10%	15.04%	(3.94%)	60.09%	47.26%	12.83%
82	11.23	187.17%	64.66%	160.29%	63.60%	175.06%	175.04%	8.92%	12.84%	(3.91%)	62.28%	59.09%	3.19%
83	11.82	197.00%	67.45%	167.20%	66.24%	182.33%	182.31%	5.25%	4.15%	1.10%	56.76%	54.85%	1.92%
84	12.32	205.33%	69.48%	172.24%	68.30%	188.00%	187.98%	4.23%	3.11%	1.12%	49.15%	50.05%	(0.90%)
85	12.62	210.33%	71.99%	178.46%	70.97%	195.35%	195.33%	2.44%	3.91%	(1.47%)	35.99%	44.84%	(8.85%)
86	12.86	214.33%	72.61%	180.00%	73.71%	202.89%	202.86%	1.90%	3.86%	(1.96%)	24.73%	30.77%	(6.04%)
87	13.17	219.50%	74.24%	184.04%	75.42%	207.60%	207.57%	2.41%	2.32%	0.09%	17.28%	18.58%	(1.31%)
88	13.55	225.83%	75.91%	188.18%	78.53%	216.16%	216.12%	2.89%	4.12%	(1.24%)	14.64%	18.55%	(3.91%)
89	14.17	236.17%	78.63%	194.92%	81.34%	223.89%	223.85%	4.58%	3.58%	1.00%	15.02%	19.09%	(4.07%)
90	14.79	246.50%	81.55%	202.16%	84.19%	231.74%	231.70%	4.38%	3.50%	0.87%	17.19%	18.62%	(1.43%)
91	15.60	260.00%	84.80%	210.21%	87.06%	239.64%	239.60%	5.48%	3.41%	2.07%	21.31%	18.11%	3.20%
92	16.53	275.50%	88.34%	218.99%	90.34%	248.67%	248.63%	5.96%	3.77%	2.19%	25.51%	19.78%	5.73%
93	17.23	287.17%	91.71%	227.34%	93.46%	257.25%	257.21%	4.23%	3.45%	0.78%	27.16%	19.01%	8.14%
94	17.95	299.17%	94.70%	234.75%	95.70%	263.42%	263.38%	4.18%	2.40%	1.78%	26.68%	17.66%	9.02%
95	18.02	300.33%	97.53%	241.77%	97.81%	269.23%	269.19%	0.39%	2.21%	(1.82%)	21.84%	16.18%	5.66%
96	18.58	309.67%	100.00%	247.89%	100.00%	275.25%	275.22%	3.11%	2.24%	0.87%	19.10%	14.87%	4.24%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		5.53%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		3.66%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.75%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Standard Industrial Classification 3721 Aircraft Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	6.21	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	6.63	106.76%	43.67%	108.25%	38.27%	105.34%	105.34%	6.76%	5.34%	1.42%			
77	7.07	113.85%	46.20%	114.53%	39.97%	110.02%	110.03%	6.64%	4.44%	2.19%			
78	7.70	123.99%	49.78%	123.40%	42.77%	117.73%	117.73%	8.91%	7.01%	1.90%			
79	8.50	136.88%	52.78%	130.84%	45.51%	125.27%	125.28%	10.39%	6.41%	3.98%			
80	9.66	155.56%	56.39%	139.79%	48.99%	134.85%	134.85%	13.65%	7.65%	6.00%	55.56%	34.85%	20.70%
81	10.74	172.95%	61.30%	151.96%	56.36%	155.13%	155.13%	11.18%	15.04%	(3.86%)	61.99%	47.26%	14.73%
82	11.85	190.82%	64.66%	160.29%	63.60%	175.06%	175.04%	10.34%	12.84%	(2.50%)	67.61%	59.09%	8.52%
83	12.58	202.58%	67.45%	167.20%	66.24%	182.33%	182.31%	6.16%	4.15%	2.01%	63.38%	54.85%	8.53%
84	12.91	207.89%	69.48%	172.24%	68.30%	188.00%	187.98%	2.62%	3.11%	(0.49%)	51.88%	50.05%	1.83%
85	13.18	212.24%	71.99%	178.46%	70.97%	195.35%	195.33%	2.09%	3.91%	(1.82%)	36.44%	44.84%	(8.40%)
86	13.48	217.07%	72.61%	180.00%	73.71%	202.89%	202.86%	2.28%	3.86%	(1.58%)	25.51%	30.77%	(5.26%)
87	13.74	221.26%	74.24%	184.04%	75.42%	207.60%	207.57%	1.93%	2.32%	(0.39%)	15.95%	18.58%	(2.63%)
88	14.18	228.34%	75.91%	188.18%	78.53%	216.16%	216.12%	3.20%	4.12%	(0.92%)	12.72%	18.55%	(5.83%)
89	14.89	239.77%	78.63%	194.92%	81.34%	223.89%	223.85%	5.01%	3.58%	1.43%	15.34%	19.09%	(3.75%)
90	15.66	252.17%	81.55%	202.16%	84.19%	231.74%	231.70%	5.17%	3.50%	1.67%	18.82%	18.62%	0.20%
91	16.72	269.24%	84.80%	210.21%	87.06%	239.64%	239.60%	6.77%	3.41%	3.36%	24.04%	18.11%	5.93%
92	17.70	285.02%	88.34%	218.99%	90.34%	248.67%	248.63%	5.86%	3.77%	2.09%	28.82%	19.78%	9.04%
93	18.43	296.78%	91.71%	227.34%	93.46%	257.25%	257.21%	4.12%	3.45%	0.67%	29.97%	19.01%	10.96%
94	19.50	314.01%	94.70%	234.75%	95.70%	263.42%	263.38%	5.81%	2.40%	3.41%	30.96%	17.66%	13.30%
95	19.97	321.58%	97.53%	241.77%	97.81%	269.23%	269.19%	2.41%	2.21%	0.20%	27.52%	16.18%	11.34%
96	20.49	329.95%	100.00%	247.89%	100.00%	275.25%	275.22%	2.60%	2.24%	0.36%	22.55%	14.87%	7.68%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		5.85%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		3.99%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		4.28%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Standard Industrial Classification 3724 Aircraft Engines Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	6.04	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	6.46	106.95%	43.67%	108.25%	38.27%	105.34%	105.34%	6.95%	5.34%	1.61%			
77	7.05	116.72%	46.20%	114.53%	39.97%	110.02%	110.03%	9.13%	4.44%	4.69%			
78	7.80	129.14%	49.78%	123.40%	42.77%	117.73%	117.73%	10.64%	7.01%	3.63%			
79	8.53	141.23%	52.78%	130.84%	45.51%	125.27%	125.28%	9.36%	6.41%	2.95%			
80	9.42	155.96%	56.39%	139.79%	48.99%	134.85%	134.85%	10.43%	7.65%	2.79%	55.96%	34.85%	21.11%
81	10.41	172.35%	61.30%	151.96%	56.36%	155.13%	155.13%	10.51%	15.04%	(4.53%)	61.15%	47.26%	13.89%
82	11.16	184.77%	64.66%	160.29%	63.60%	175.06%	175.04%	7.20%	12.84%	(5.63%)	58.30%	59.09%	(0.80%)
83	11.61	192.22%	67.45%	167.20%	66.24%	182.33%	182.31%	4.03%	4.15%	(0.12%)	48.85%	54.85%	(6.00%)
84	12.40	205.30%	69.48%	172.24%	68.30%	188.00%	187.98%	6.80%	3.11%	3.69%	45.37%	50.05%	(4.68%)
85	12.85	212.75%	71.99%	178.46%	70.97%	195.35%	195.33%	3.63%	3.91%	(0.28%)	36.41%	44.84%	(8.43%)
86	13.08	216.56%	72.61%	180.00%	73.71%	202.89%	202.86%	1.79%	3.86%	(2.07%)	25.65%	30.77%	(5.12%)
87	13.33	220.70%	74.24%	184.04%	75.42%	207.60%	207.57%	1.91%	2.32%	(0.41%)	19.44%	18.58%	0.86%
88	13.80	228.48%	75.91%	188.18%	78.53%	216.16%	216.12%	3.53%	4.12%	(0.60%)	18.86%	18.55%	0.32%
89	14.42	238.74%	78.63%	194.92%	81.34%	223.89%	223.85%	4.49%	3.58%	0.91%	16.29%	19.09%	(2.79%)
90	14.84	245.70%	81.55%	202.16%	84.19%	231.74%	231.70%	2.91%	3.50%	(0.59%)	15.49%	18.62%	(3.13%)
91	15.38	254.64%	84.80%	210.21%	87.06%	239.64%	239.60%	3.64%	3.41%	0.23%	17.58%	18.11%	(0.53%)
92	16.28	269.54%	88.34%	218.99%	90.34%	248.67%	248.63%	5.85%	3.77%	2.08%	22.13%	19.78%	2.35%
93	16.70	276.49%	91.71%	227.34%	93.46%	257.25%	257.21%	2.58%	3.45%	(0.87%)	21.01%	19.01%	2.00%
94	17.31	286.59%	94.70%	234.75%	95.70%	263.42%	263.38%	3.65%	2.40%	1.25%	20.04%	17.66%	2.38%
95	17.34	287.09%	97.53%	241.77%	97.81%	269.23%	269.19%	0.17%	2.21%	(2.03%)	16.85%	16.18%	0.66%
96	18.22	301.66%	100.00%	247.89%	100.00%	275.25%	275.22%	5.07%	2.24%	2.84%	18.47%	14.87%	3.60%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		5.40%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		3.56%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.37%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Standard Industrial Classification 3728 Aircraft Parts & Equipment Employment Cost Indices Compared to DOD Employment Cost Indices													
							PUBLIC						
Fiscal	Private Sector		OMN/GS WB		MPN		Composite	Annual Change			Five year change		
Year	Raw Data	Index	Raw Data	Index	Raw Data	Index	Index	Private	Public	difference	Private	Public	Difference
75	5.47	100.00%	40.34%	100.00%	36.33%	100.00%	100.00%						
76	5.95	108.78%	43.67%	108.25%	38.27%	105.34%	105.34%	8.78%	5.34%	3.43%			
77	6.44	117.73%	46.20%	114.53%	39.97%	110.02%	110.03%	8.24%	4.44%	3.79%			
78	6.93	126.69%	49.78%	123.40%	42.77%	117.73%	117.73%	7.61%	7.01%	0.60%			
79	7.48	136.75%	52.78%	130.84%	45.51%	125.27%	125.28%	7.94%	6.41%	1.53%			
80	8.40	153.56%	56.39%	139.79%	48.99%	134.85%	134.85%	12.30%	7.65%	4.65%	53.56%	34.85%	18.71%
81	9.35	170.93%	61.30%	151.96%	56.36%	155.13%	155.13%	11.31%	15.04%	(3.73%)	57.14%	47.26%	9.88%
82	10.17	185.92%	64.66%	160.29%	63.60%	175.06%	175.04%	8.77%	12.84%	(4.07%)	57.92%	59.09%	(1.17%)
83	10.73	196.16%	67.45%	167.20%	66.24%	182.33%	182.31%	5.51%	4.15%	1.36%	54.83%	54.85%	(0.01%)
84	11.37	207.86%	69.48%	172.24%	68.30%	188.00%	187.98%	5.96%	3.11%	2.85%	52.01%	50.05%	1.95%
85	11.66	213.16%	71.99%	178.46%	70.97%	195.35%	195.33%	2.55%	3.91%	(1.36%)	38.81%	44.84%	(6.03%)
86	11.90	217.55%	72.61%	180.00%	73.71%	202.89%	202.86%	2.06%	3.86%	(1.80%)	27.27%	30.77%	(3.50%)
87	12.23	223.58%	74.24%	184.04%	75.42%	207.60%	207.57%	2.77%	2.32%	0.45%	20.26%	18.58%	1.68%
88	12.28	224.50%	75.91%	188.18%	78.53%	216.16%	216.12%	0.41%	4.12%	(3.71%)	14.45%	18.55%	(4.10%)
89	12.81	234.19%	78.63%	194.92%	81.34%	223.89%	223.85%	4.32%	3.58%	0.74%	12.66%	19.09%	(6.42%)
90	13.37	244.42%	81.55%	202.16%	84.19%	231.74%	231.70%	4.37%	3.50%	0.87%	14.67%	18.62%	(3.96%)
91	14.05	256.86%	84.80%	210.21%	87.06%	239.64%	239.60%	5.09%	3.41%	1.68%	18.07%	18.11%	(0.04%)
92	14.89	272.21%	88.34%	218.99%	90.34%	248.67%	248.63%	5.98%	3.77%	2.21%	21.75%	19.78%	1.97%
93	15.72	287.39%	91.71%	227.34%	93.46%	257.25%	257.21%	5.57%	3.45%	2.12%	28.01%	19.01%	9.00%
94	16.01	292.69%	94.70%	234.75%	95.70%	263.42%	263.38%	1.84%	2.40%	(0.55%)	24.98%	17.66%	7.32%
95	15.93	291.22%	97.53%	241.77%	97.81%	269.23%	269.19%	(0.50%)	2.21%	(2.71%)	19.15%	16.18%	2.97%
96	16.43	300.37%	100.00%	247.89%	100.00%	275.25%	275.22%	3.14%	2.24%	0.90%	16.94%	14.87%	2.07%
97		0.00%	102.80%	254.83%	102.72%	282.74%	282.71%						
annual inflation rate 75 -		5.38%		4.42%		4.94%	4.94%						
annual inflation rate 82 -		3.49%		3.16%		3.29%	3.29%						
annual inflation rate 86 -		3.28%		3.25%		3.10%	3.10%						
				DOD		MPN							
Weights for public weighted average				0.13%		99.87%							

Aircraft Maintenance Cost Index

Aircraft Maintenance Weighted Composite Cost Index														
	VAMOSC Aircraft Maintenance	Percent of Total	Cost Indices Used by Naval Center for Cost Analysis to Escalate VAMOSC Data to 1997 Dollars											
Appropriation	Dollars	weights	86	87	88	89	90	91	92	93	94	95	96	97
MPN	255731.12	0.4782	0.7142	0.7308	0.7472	0.7739	0.8027	0.8347	0.8696	0.9028	0.9259	0.949	0.9723	1
OMN	236450.97	0.4422	0.7481	0.7688	0.7922	0.8272	0.8608	0.8914	0.9124	0.9322	0.9509	0.9689	0.9886	1
APN	42550.4	0.0796	0.7692	0.7933	0.8278	0.8609	0.8906	0.9162	0.9369	0.9548	0.9738	0.9928	1.0135	1
Weighted composite Cost index			**0.7336**	**0.7526**	**0.7735**	**0.8044**	**0.8354**	**0.8663**	**0.8939**	**0.9199**	**0.9408**	**0.9613**	**0.9828**	**1**

APPENDIX B. IN-HOUSE COST

This appendix contains the data and calculations summarized in Chapter IV. Chapter IV presented the results and analysis of the in-house cost calculations. The actual calculations and the data used for those calculations are presented here. The procurement cost data and calculations are presented first, followed by the weighted average personnel cost calculation and the military composite standard pay data. Finally, the total in-house cost calculations for option one and option two are presented.

UH - 60 Procurement Data for Learning Curve Calculation

Fiscal Year	Quantity Procured in current year	Procurement Cost in millions of then year dollars	Cost per UH- 60 in millions of then year dollars	Escalation factors Aircraft Procurement	Cost per UH-60 in millions of FY 1997 dollars	Aircraft Procured to date	Cumulative average cost per UH-60 in millions of FY 1997 dollars
1977	15	$125.86	$8.39	0.394	$21.30	15	$21.30
1978	56	$218.06	$3.89	0.435	$8.95	71	$11.56
1979	92	$353.77	$3.85	0.485	$7.93	163	$9.51
1980	94	$340.79	$3.63	0.541	$6.70	257	$8.48
1981	85	$435.50	$5.12	0.595	$8.61	342	$8.51
1982	102	$605.04	$5.93	0.64	$9.27	444	$8.69
1983	96	$540.59	$5.63	0.674	$8.35	540	$8.63
1984	84	$418.80	$4.99	0.698	$7.14	624	$8.43
1985	86	$442.80	$5.15	0.719	$7.16	710	$8.28
1986	78	$386.10	$4.95	0.742	$6.67	788	$8.12
1987	82	$368.60	$4.50	0.769	$5.85	870	$7.90
1988	72	$483.50	$6.72	0.799	$8.40	942	$7.94
1989	72	$421.20	$5.85	0.83	$7.05	1014	$7.88
1990	72	$361.10	$5.02	0.857	$5.85	1086	$7.74
1991	48	$152.40	$3.18	0.88	$3.61	1134	$7.57
1992	60	$507.40	$8.46	0.9	$9.40	1194	$7.66
1993	52	$349.20	$6.72	0.918	$7.32	1246	$7.65
1994	63	$427.60	$6.79	0.937	$7.24	1309	$7.63
1995	60	$306.70	$5.11	0.957	$5.34	1369	$7.53
1996	60	$391.80	$6.53	0.978	$6.68	1429	$7.49
1997	28	$236.30	$8.44	1	$8.44	1457	$7.51

	A	B	C	D	E	F	G	H
1	**CH-60 Procurement Cost Learning Curve Calculation**							
2								
3	**All Dollar Amounts are In Thousands of Dollars**							
4								
5	**Fiscal Year**	1999	2000	2001	2002	2003		
6	**Cost per CH- 60 then year $$**	$14,700	$14,600	$15,000	$15,300	$15,700		
7	**Escalation factors APN**	1.0927	1.1255	1.1593	1.1941	1.2299		
8	**Cost per CH-60 FY 1997 $$$**	$13,856.50	$13,361.17	$13,327.01	$13,197.39	$13,148.22		
9	**Number of aircraft procured**	6	18	18	18	18		
10	**Total aircraft procured**	6	24	42	60	78		
11	**Cumulative average cost per CH-60**	$13,856.50	$13,485.01	$13,417.29	$13,351.32	$13,304.45		
12								
13	**All Dollar Amounts Below are In Constant 1997 Dollars**							
14								
15								
16	**Learning curve exponent (b)**	-0.18995	<<< From linear regression					
17	**Theoretical first unit cost (a)**	$ 28,603.95	<<< e^x where x is the constant from the linear regression (10.2613)					
18								
19	**Total cost of 1457 UH-60s**	$ 10,446,875.53	<<< $(a * 1457^b)*1457$					
20	**Total cost of 1535 UH-60s**	$ 10,897,656.22	<<< $(a * 1535^b)*1535$					
21	**average cost of 78 add. UH-60s**	$ 5,779.24	<<< the difference in the total costs divided by 78					
22	**Cumulative average cost 78 CH-60**	$ 13,304.45	<<< from above estimated costs provided by program office					
23	**Average cost of first 78 modifications**	$ 7,525.21	<<< Difference between the first 78 CH-60s and 78 additional UH-60s					
24								
25	**Modification Theoretical first unit cost**	$ 17,215.59	<<< solve learning equation for a = 7525.21/(78^b) where b = -0.18995					
26								
27	**Cumulative average modification cost**	$ 7,525.21	$ 6,329.28	$ 6,196.00	$ 6,148.36	<<< $17515.59*x^{b,}$		
28	**Number of CH-60s Procured (x)**	78	194	217	226			
29	**Total Cost of (1457 + x) UH-60s**	$ 10,897,656.22	$11,560,111.60	$11,690,393.11	$11,741,280.09	<<< $28603.95*(1457+x)^b*(1457+x)$		
30	**Average cost unmodified aircraft**	$ 5,779.24	$ 5,738.33	$ 5,730.50	$ 5,727.45	<<< (total cost - B19)/x		
31	**Cumulative average cost of x CH-60s**	$ 13,304.45	$ 12,067.61	$ 11,926.50	$ 11,875.81	<<< aircraft cost + modification cost		
32								
33	**Total cost of x CH-60s**	$ 1,037,747.10	$ 2,341,115.74	$ 2,588,049.84	$ 2,683,933.38	<<< average cost * x		
34								
35	**Total cost for all aircraft after 194**			$ 246,934.09	$ 342,817.63	<<< difference in total costs		
36								
37	**Number of additional aircraft required for in-house performance**			23	32			
38	**Avg Unit cost for aircraft after 194**	n/a	n/a	$ 10,736.26	$ 10,713.05			
39		(difference)/(number of additional aircraft)						

Weighted Average Calculation

HC Community Personnel Cost Weighted Average

Rank/Paygrade	Quantity	Military Standard Composite Rate	Rate * Quantity total
E-1	20	$21,547	$430,940
E-2	38	$24,341	$924,958
E-3	80	$26,582	$2,126,560
E-4	188	$31,956	$6,007,728
E-5	203	$38,288	$7,772,464
E-6	131	$45,752	$5,993,512
E-7	42	$52,589	$2,208,738
E-8	17	$59,997	$1,019,949
E-9	5	$70,674	$353,370
Total	724		$26,838,219
Weighted average equals total cost of personnel divided by the total number of personnel			**$37,069.36**

Rank/Paygrade	Quantity	Military Standard Composite Rate	Rate * Quantity total
cw2	5	$64,155	$320,775
CW3	4	$72,623	$290,492
CW4	2	$87,802	$175,604
O-1	1	$49,286	$49,286
O-2	24	$61,193	$1,468,632
O-3	86	$77,278	$6,645,908
O-4	24	$89,732	$2,153,568
O-5	4	$105,904	$423,616
Total	150		$11,527,881
Weighted average equals total cost of personnel divided by the total number of personnel			**$76,852.54**

Data from HC-5 and HC-11

MILITARY COMPOSITE STANDARD PAY AND REIMBURSEMENT RATES
DEPARTMENT OF THE NAVY FOR FISCAL YEAR 1997

GRADE	BASIC PAY (1)	RETIRED PAY ACCRUAL (2)	BASIC ALLOWANCE FOR QUARTERS (3)	ANCENTIVE AND SPECIAL PAY (4)	PERMANENT CHANGE OF STATION (5)	MISCEL-LANEOUS EXPENSE (6)	ANNUAL DOD COMPOSITE RATE (7)	ACCELERATION FACTOR (8)	AMOUNT BILLABLE TO NON-DOD ENTITIES (9)
O-10	$113,141	$36,884	$2,364	$2,094	$2,993	$13,489	$170,965	$10,258	$181,223
O-9	$106,609	$34,754	$3,745	$3,267	$2,993	$11,629	$162,998	$9,780	$172,778
O-8	$96,581	$31,485	$7,831	$2,955	$2,993	$11,161	$153,007	$9,180	$162,187
O-7	$85,196	$27,774	$6,764	$2,914	$2,993	$11,384	$137,025	$8,222	$145,247
O-6	$71,460	$23,296	$11,575	$6,370	$2,993	$9,537	$125,231	$7,514	$132,745
O-5	$56,980	$18,576	$12,088	$6,404	$2,993	$8,863	$105,904	$6,354	$112,258
O-4	$46,472	$15,150	$10,325	$6,594	$2,993	$8,199	$89,732	$5,384	$95,116
O-3	$38,401	$12,519	$8,218	$6,585	$2,993	$8,562	$77,278	$4,637	$81,915
O-2	$31,023	$10,114	$6,900	$2,341	$2,993	$7,822	$61,193	$3,672	$64,865
O-1	$23,584	$7,688	$5,589	$1,845	$2,993	$7,586	$49,286	$2,957	$52,243
WO-4	$46,049	$15,012	$9,556	$3,616	$2,993	$10,576	$87,802	$5,268	$93,070
WO-3	$37,812	$12,327	$8,637	$2,666	$2,993	$81,189	$145,623	$4,357	$149,980
WO-2	$31,982	$10,426	$6,862	$4,147	$2,993	$7,744	$64,155	$3,849	$68,004
WO-1									
CADETS	$6,696			$114	$117	$2,354	$9,282	$1,671	$10,953
E-9	$38,682	$12,610	$8,998	$2,375	$1,218	$6,790	$70,674	$12,721	$83,395
E-8	$31,481	$10,262	$8,107	$2,209	$1,218	$6,700	$59,977	$10,796	$70,773
E-7	$26,664	$8,691	$7,058	$2,238	$1,218	$6,719	$52,589	$9,466	$62,055
E-6	$22,690	$7,396	$6,099	$1,934	$1,218	$6,414	$45,752	$8,235	$53,987
E-5	$18,564	$6,050	$4,618	$1,485	$1,218	$6,353	$38,288	$6,892	$45,180
E-4	$15,300	$4,983	$3,015	$1,138	$1,218	$6,301	$31,956	$5,752	$37,708
E-3	$13,009	$4,228	$1,753	$192	$1,218	$6,182	$26,582	$4,785	$31,367
E-2	$12,034	$3,896	$927	$190	$1,218	$6,075	$24,341	$4,381	$28,722
E-1	$10,329	$3,335	$593	$172	$1,218	$5,899	$21,547	$3,878	$25,425

Note: (1) Column 9 includes factors for other Personnel Support Costs only (6% for Officers and 18% for Enlisted Personnel).
(2) To compute a Daily Rate that includes 14% for Leave and Holiday Pay, a factor of .00439 may be applied to Column 9. For an Hourly Rate, .00055 may be used.

HH-60 VAMOSC Data and Operating Cost Calculation

VAMOSC ATMSR DATA (Escalated to FY97$)
($ in Thousands, Data as listed)

ELEMENT NO	ELEMENT DESCRIPTION	T/M/S	89	90	91	92	93	94	95	96	Totals of Sub Totals	Average Cost Per Flight Hour total cost divided by total flight time
1	Subtotal Organizational	HH-60H	1,001.40	7,773.86	7,927.14	15,448.37	19,982.87	17,927.37	28,034.93	45,230.21	143,326.15	3.362978178
1.1	Subtot Personnel Costs	HH-60H	609.51	5,593.62	4,679.53	10,057.11	10,682.86	11,370.56	17,211.06	28,879.77		
1.1.1	Military Personnel Costs	HH-60H	609.51	5,593.62	4,679.53	9,607.75	10,369.41	11,370.56	17,211.06	28,879.77		
1.1.2	Civilian Personnel Costs	HH-60H	0	0	0	0	0	0	0	0		
1.1.3	Contractor Personnel Costs	HH-60H	0	0	0	449.36	313.45	0	0	0		Without Personnel
1.2	Subtot Org. Operations	HH-60H	391.89	2,180.24	3,247.61	5,391.26	9,300.01	6,556.81	10,823.87	16,350.44	54242.13	1.707079817
1.2.1	Temp. Additional Duty	HH-60H	0	0	0	261.18	217.22	10.19	61.5	193.71		
1.2.2	Training Expend. Stores	HH-60H	86.64	25.78	34.66	565.47	813.06	440.84	1,122.33	2,291.29		
1.2.3	Support Supplies	HH-60H	262.69	970.03	1,594.46	1,576.28	1,811.52	1,676.41	2,167.71	3,058.27		
1.2.4	AVDLR	HH-60H	0	679.48	989.12	2,165.82	5,549.24	3,661.69	6,369.80	9,083.15		
1.2.5	Fuel	HH-60H	42.56	504.95	629.37	822.51	908.97	767.68	1,102.53	1,724.02		
2	Intermediate Costs	HH-60H	0	796.31	899.84	1,395.10	1,328.90	1,750.95	3,357.91	4,370.81	13899.82	
2.1	Subtot Intermediate Cost	HH-60H	0	796.31	899.84	1,395.10	1,328.90	1,750.95	3,357.91	4,370.81		
2.1.1	Military Personnel Cost	HH-60H	0	796.31	899.84	1,350.05	1,309.70	1,742.85	3,330.46	4,318.21		
2.1.2	Civilian Personnel Cost	HH-60H	0	0	0	35.41	14.48	7.05	25.49	49.26		
2.1.3	Contractor Personnel Cost	HH-60H	0	0	0	9.64	4.72	1.05	1.96	3.34		
3.0 (87-91)	Subtot Depot Support FY87-91	HH-60H	515.84	1,103.62	6.62	0						
3.0 (92->)	Subtot Depot Support FY92->	HH-60H	0	0	0	847.11	1,107.05	1,078.56	1,947.99	4,877.50	11484.29	
3.1 (87-91)	Subtot A/C Rework FY87-91	HH-60H	496.25	595.14	0	0						
3.1 (92->)	Subtot A/C Rework FY92->	HH-60H	0	0	0	0	0	0	0	2,072.84		
3.1.1 (87-91)	A/C Rework Intra-DOD	HH-60H	475.1	0	0	0						
3.1.1 (92->)	Organic A/C Rework FY92->	HH-60H	0	0	0	0	0	0	0	0		
3.1.1.1	Organic A/C Rework Units	HH-60H	0	0	0	0	0	0	0	0		
3.1.2 (87-91)	A/C Rework Commercial	HH-60H	21.16	595.14	0	0						
3.1.2 (92->)	Commercial A/C Rework FY92->	HH-60H	0	0	0	0	0	0	0	0		
3.1.2.1	Commercial A/C Units	HH-60H	0	0	0	0	0	0	0	0		
3.1.3	DMISA A/C Rework FY92->	HH-60H	0	0	0	0	0	0	0	2,072.84		
3.1.3.1	DMISA A/C Rework Units	HH-60H	0	0	0	0	0	0	0	2		
3.2 (87-91)	Subtot Engine Rework FY87-91	HH-60H	0	3.02	5.83	0						
3.2 (92->)	Total A/C Rework Units	HH-60H										
3.2.1	Engine Rework Intra-DOD	HH-60H	0	3.02	5.83	0						
3.2.2	Engine Rework Commercial	HH-60H	0	0	0	0						
3.3 (87-91)	Subtot Component Rework FY87-91	HH-60H	19.58	504.19	0	0						
3.3 (92->)	Subtot Engine Rework FY92->	HH-60H	0	0	0	90.1	389.84	350.51	575.91	418.17		
3.3.1 (87-91)	Component Rework-DOD	HH-60H	15.11	0	0	0						
3.3.1 (92->)	Organic Engine Rework FY92->	HH-60H	0	0	0	0	0	0	0	0		
3.3.1.1	Organic Engine Rework Units	HH-60H	0	0	0	0	0	0	0	0		
3.3.2 (87-91)	Component Rework-Comm	HH-60H	4.47	504.19	0	0						
3.3.2 (92->)	Commercial Engine Rework FY92->	HH-60H	0	0	0	0	0	0	0	0		
3.3.2.1	Commercial Engine Rework Units	HH-60H	0	0	0	0	0	0	0	0		
3.3.3	DMISA Engine Rework FY92->	HH-60H	0	0	0	90.1	389.84	350.51	575.91	418.17		
3.3.3.1	DMISA Engine Rework Units	HH-60H	0	0	0	1.2	5.1	3.9	7.7	4.5		

HH-60H VAMOSC

3.4 (87-91)	Subtot Other Rework FY87-91	HH-60H	0	1.28	0.79	0					
3.4 (92->)	Total Engine Rework FY92->	HH-60H	0	0	0	1.2	5.1	3.9	7.7	4.5	
3.4.1	Other Rework Misc Depot	HH-60H	0	1.28	0.79	0					
3.4.2	Other Rework Engine Support	HH-60H	0	0	0	0					
3.5	AC Support Services FY92->	HH-60H	0	0	0	257.56	348.53	254.6	495.61	1,969.55	
3.6	Subtot A/C Emergency FY92->	HH-60H	0	0	0	499.45	368.16	473.24	875.84	416.95	
3.6.1	Organic A/C Emergency FY92->	HH-60H	0	0	0	328.46	290.49	198.55	432.96	337.35	
3.6.2	Commercial A/C Emergency FY92->	HH-60H	0	0	0	166.38	77.24	274.48	438.75	64.03	
3.6.3	DMISA A/C Emergency FY92->	HH-60H	0	0	0	4.61	0.43	0.22	4.12	15.58	
3.7	Subtot Engine Emergency FY92->	HH-60H	0	0	0	0	0.54	0.22	0.62	0	
3.7.1	Organic Engine Emergency FY92->	HH-60H	0	0	0	0	0.11	0	0	0	
3.7.2	Commercial Engine Emergency FY92->	HH-60H	0	0	0	0	0	0	0	0	
3.7.3	DMISA Engine Emergency FY92->	HH-60H	0	0	0	0	0.43	0.22	0.62	0	
4	Subtot Training Support	HH-60H	0	57.27	80.32	63.45	315.92	194.03	1,966.98	1,275.03	3953
4.1	Subtotal FRS	HH-60H	0	0	0	0	0	0	0	0	
4.1.1	Subtotal FRS Personnel	HH-60H	0	0	0	0	0	0	0	0	
4.1.1.1	FRS Military Personnel	HH-60H	0	0	0	0	0	0	0	0	
4.1.1.2	FRS Civilian Personnel	HH-60H	0	0	0	0	0	0	0	0	
4.1.1.3	FRS Contractor Personnel	HH-60H	0	0	0	0	0	0	0	0	
4.1.2	Subtotal FRS Operations	HH-60H	0	0	0	0	0	0	0	0	
4.1.2.1	FRS Temporary Additional Duty	HH-60H	0	0	0	0	0	0	0	0	
4.1.2.2	FRS Training Expen Stores	HH-60H	0	0	0	0	0	0	0	0	
4.1.2.3	FRS Support Supplies	HH-60H	0	0	0	0	0	0	0	0	
4.1.2.4	FRS AVDLR	HH-60H	0	0	0	0	0	0	0	0	
4.1.2.5	FRS Fuel	HH-60H	0	0	0	0	0	0	0	0	
4.2	Subtot O/M Training	HH-60H	0	57.27	80.32	63.45	315.92	194.03	1,966.98	1,275.03	
4.2.1	Operational Training	HH-60H	0	0	0	0	0	0.74	0	0	
4.2.2	Maintenance Training	HH-60H	0	57.27	80.32	63.45	315.92	193.29	1,966.98	1,275.03	
5.0 (87-91)	Subtot Recurring Investment FY87-91	HH-60H	0	0	0	0					
5.0 (92->)	Subtot Recurring Investment FY92->	HH-60H	0	0	0	458.31	923.22	790.51	1,732.77	1,231.08	5135.89
5.1 (87-91)	Replacement Repair FY87-91	HH-60H	0	0	0	0					
5.1 (92->)	Subtot Modifications FY92->	HH-60H	0	0	0	458.31	923.22	790.51	1,732.77	1,231.08	
5.1.1	Kits Costs FY92->	HH-60H	0	0	0	177.72	465.96	709.39	1,416.20	882.39	
5.1.2	Spares Costs FY92->	HH-60H	0	0	0	280.61	457.27	81.13	316.58	348.69	
5.1.3	Installation Costs FY92->	HH-60H	0	0	0	113.99	120.55	72.19	25.89	0	
5.2	Modifications FY87-91	HH-60H	0	0	0	0					
6	Other Functions	HH-60H	28.53	254.18	321.74	348.31	362.37	356.62	632.88	817.72	3122.35
6.1	NETS	HH-60H	9.07	111.41	92.66	92.72	136.03	126.93	260.92	339.07	
6.2	CETS	HH-60H	19.46	142.77	229.08	255.6	226.34	153.96	266.27	366.38	
6.3	Publications	HH-60H	0	0	0	0	0	75.72	105.69	112.29	
A.1	Total Aircraft Number	HH-60H	1	11.5	15	18	18	18	29	38	
A.1.1	Regular Aircraft	HH-60H	1	11.5	15	18	18	18	29	38	
A.1.2	Fleet Readiness Sq	HH-60H	0	0	0	0	0	0	0	0	
A.2	Total Flying Hours	HH-60H	187	3,495.00	3,890.00	6,662.90	8,218.00	6,628.00	9,649.00	15,068.10	53798
A.2.1	Regular Flying Hours	HH-60H	187	3,495.00	3,890.00	6,662.90	8,218.00	6,628.00	9,649.00	15,068.10	
A.2.2	Fleet Readiness Sq	HH-60H	0	0	0	0	0	0	0	0	
											Cumulative Average
	Average cost per flight hour with people		8.26615	2.85701	2.37421	2.785671	2.922892	3.334043	3.90439	3.836074	3.362978178

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Average cost per flt hour without people	5.00674	1.25654	1.17124	1.276252	1.622958	1.618509	2.120676	1.919458	1.707079817
utilization rate	187	303.913	259.333	370.1611	456.5556	368.2222	332.7241	396.5289	
Total cost	1,545.77	9,985.24	9,235.66	18,560.65	24,020.33	22,098.04	37,673.46	57,802.35	

CH-46D VAMOSC Data and Operating Cost Calculation

VAMOSC ATMSR DATA (Escalated to FY97$)
($ in Thousands, Data as listed)

ELEMENT NO	ELEMENT DESCRIPTION	T/M/S	87	88	89	90	91	92	93	94	95	98	Totals of Sub Totels	Average Cost Per Flight Hour total cost divided by total flight time 4.657
1	Subtotal Organizational	CH-48D	29,987.29	27,803.84	28,498.43	28,259.22	30,074.05	29,814.88	17,115.91	22,378.50	38,982.08	32,146.97	280,859.17	
1.1	Subtot Personnel Costs	CH-46D	15,458.40	18,815.90	18,789.81	17,044.10	17,377.50	18,969.18	8,945.50	9,993.31	21,447.62	20,526.69	138,238.34	
1.1.1	Military Personnel Costs	CH-48D	15,458.40	18,815.90	18,789.81	17,044.10	17,377.50	18,969.18	8,945.50	9,993.31	21,447.82	20,528.69		
1.1 2	Civilian Personnel Costs	CH-48D	0	0	0	0	0	0	0	0	0	0		
1.1.3	Contractor Personnel Costs	CH-48D	0	0	0	0	0	0	0	0	0	0		Without Personnel
1.2	Subtot Org. Operations	CH-48D	14,528.89	11,187.94	7,728.82	11,215.12	12,898.55	10,845.70	10,170.41	12,383.19	15,534.48	11,620.28	117,711.38	3.285
1.2.1	Temp. Additional Duty	CH-48D	53.2	59.98	0	0	0	71.24	35.29	89.2	79.57	90.53	60,354.04	
1.2 2	Training Expend. Stores	CH-48D	0	0	0	0	0	0	0	0	0	0		
1.2.3	Support Supplies	CH-48D	2,814.90	3,125.98	2,775.63	2,942.15	4,297.17	3,424.92	3,290.07	3,878.84	3,898.65	3,197.35		
1.2.4	AVDLR	CH-48D	9,158.74	8,122.44	2,718.09	6,721.19	8,880.84	5,970.98	5,843.27	7,324.11	10,571.58	7,389.04		
1.2.5	Fuel	CH-46D	2,504.05	1,879.58	2,235.10	1,551.78	1,518.74	1,178.58	1,001.78	1,111.24	984.68	943.38		
2	Intermediate Costs	CH-46D	1,828.38	1,758.48	1,872.72	2,891.37	3,211.57	3,883.88	3,618.32	4,117.78	3,853.43	3,782.98	30,818.69	
2.1	Subtot Intermediate Cost	CH-46D	1,828.38	1,758.48	1,872.72	2,891.37	3,211.57	3,883.88	3,816.32	4,117.78	3,853.43	3,782.98	19,254.19	
2.1.1	Military Personnel Cost	CH-48D	1,779.97	1,714.81	1,872.72	2,891.37	3,211.57	3,798.30	3,538.33	4,083.83	3,793.28	3,714.80		
2.1.2	Civilian Personnel Cost	CH-48D	38.37	34.71	0	0	0	62.91	52.87	45.85	56.04	64.03		
2.1.3	Contractor Personnel Cost	CH-48D	10.02	8.98	0	0	0	22.47	25.32	8.1	4.13	4.35		
3.0 (87-91)	Subtot Depot Support FY87-91	CH-46D	19,130.20	21,812.17	9,375.00	1,695.40	8,402.29	0						
3.0 (92->)	Subtot Depot Support FY92->	CH-48D	0	0	0	0	0	5,878.37	5,074.13	4,400.78	5,072.98	8,609.15	89,448.45	
3.1 (87-91)	Subtot A/C Rework FY87-91	CH-46D	12,987.87	17,398.77	8,453.82	508.39	4,138.33	0					29,033.39	
3.1 (92->)	Subtot A/C Rework FY92->	CH-48D	0	0	0	0	0	3,125.93	2,809.48	1,733.52	2,501.60	4,587.78		
3.1.1 (87-91)	A/C Rework Intra-DOD	CH-48D	12,903.75	17,398.77	8,453.82	508.39	4,138.33	0						
3.1.1 (92->)	Organic A/C Rework FY92->	CH-48D	0	0	0	0	0	3,125.93	2,809.48	1,733.52	2,501.60	4,567.78		
3.1.1.1	Organic A/C Rework Units	CH-48D	0	0	0	0	0	24	5	3	4	22		
3.1 2 (87-91)	A/C Rework Commercial	CH-46D	84.13	0	0	0	0	0						
3.1.2 (92->)	Commercial A/C Rework FY92->	CH-46D	0	0	0	0	0	0	0	0	0	0		
3.1.2.1	Commercial A/C Units	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.1.3	DMISA A/C Rework FY92->	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.1.3 1	DMISA A/C Rework Units	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.2 (87-91)	Subtot Engine Rework FY87-91	CH-48D	3,537.21	452.68	288.99	184.73	3,988.03	0						
3.2 (92->)	Total A/C Rework Units	CH-48D												
3.2.1	Engine Rework Intra-DOD	CH-48D	3,537.21	452.88	288.99	184.73	3,988.03	0						
3.2.2	Engine Rework Commercial	CH-46D	0	0	0	0	0	0						
3.3 (87-91)	Subtot Component Rework FY87-91	CH-48D	2,197.97	3,578.49	289.35	982.48	170.88	0						
3.3 (92->)	Subtot Engine Rework FY92->	CH-46D	0	0	0	0	0	369.58	295.88	844.14	829.4	1,305.48		
3.3.1 (87-91)	Component Rework-DOD	CH-48D	2,197.97	3,578.49	269.35	982.48	170.88	0						
3.3.1 (92->)	Organic Engine Rework FY92->	CH-48D	0	0	0	0	0	369.58	295.86	844.14	829.4	1,305.48		
3.3.1.1	Organic Engine Rework Units	CH-48D	0	0	0	0	0	8	6.7	18.5	13.2	25.7		
3.3.2 (87-91)	Component Rework-Comm	CH-48D	0	0	0	0	0	0						
3.3 2 (92->)	Commercial Engine Rework FY92->	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.3 2.1	Commercial Engine Rework Units	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.3 3	DMISA Engine Rework FY92->	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.3.3 1	DMISA Engine Rework Units	CH-46D	0	0	0	0	0	0	0	0	0	0		
3 4 (87-91)	Subtot Other Rework FY87-91	CH-48D	427.18	384.25	384.84	81.8	125.08	0						
3.4 (92->)	Total Engine Rework FY92->	CH-48D	0	0	0	0	0	8	6.7	18.5	13.2	25.7		
3.4 1	Other Rework Misc Depot	CH-48D	427.18	384 25	384.84	81 8	125.08	0						
3.4 2	Other Rework Engine Support	CH-48D	0	0	0	0	0	0						
3.5	AC Support Services FY92->	CH-48D	0	0	0	0	0	1,835.27	1,480.79	1,395.73	1,145.00	2,391.87		
3.8	Subtot A/C Emergency FY92->	CH-48D	0	0	0	0	0	544.81	485.95	428.23	595.1	344.02		
3.8.1	Organic A/C Emergency FY92->	CH-48D	0	0	0	0	0	458.79	409.89	380.27	540.82	303.48		
3.8 2	Commercial A/C Emergency FY92->	CH-48D	0	0	0	0	0	81.78	74.02	45.01	44.58	21.95		
3.8 3	DMISA A/C Emergency FY92->	CH-48D	0	0	0	0	0	4.05	2.04	0.95	9.7	18.81		
3.7	Subtot Engine Emergency FY92->	CH-48D	0	0	0	0	0	0.99	2.04	1.18	1.88	0		
3.7.1	Organic Engine Emergency FY92->	CH-48D	0	0	0	0	0	0.55	0.42	0.22	0.2	0		
3.7 2	Commercial Engine Emergency FY92->	CH-48D	0	0	0	0	0	0	0	0	0	0		
3.7 3	DMISA Engine Emergency FY92->	CH-48D	0	0	0	0	0	0 44	1 81	0.95	1 68	0		

CH-46D VAMOSC

4	Subtot Training Support	CH-46D	10,873.06	10,484.59	11,044.06	11,635.97	13,171.80	13,372.66	8,414.98	8,064.27	12,489.40	7,776.46	107,329.27
4.1	Subtotal FRS	CH-48D	10,170.55	9,451.52	10,249.57	10,928.40	12,850.17	13,009.45	7,973.98	7,807.57	11,538.33	7,700.87	50,119.77
4.1.1	Subtotal FRS Personnel	CH-46D	8,696.63	6,634.90	8,559.25	8,310.08	8,627.77	8,642.13	4,578.20	4,141.27	4,001.26	2,013.08	
4.1.1.1	FRS Military Personnel	CH-46D	6,696.63	6,634.90	8,559.25	8,310.08	8,627.77	8,642.13	4,578.20	4,141.27	4,001.28	2,013.06	
4.1.1.2	FRS Civilian Personnel	CH-46D	0	0	0	0	0	0	0	0	0	0	
4.1.1.3	FRS Contractor Personnel	CH-46D	0	0	0	0	0	0	0	0	0	0	
4.1.2	Subtotal FRS Operations	CH-48D	3,473.92	2,816.62	1,690.32	2,818.32	4,222.40	4,367.32	3,395.78	3,666.30	7,537.07	5,687.61	
4.1.2.1	FRS Temporary Additional Duty	CH-46D	0	0	0	0	0	3.62	13.41	18.09	45.52	33.58	
4.1.2.2	FRS Training Expen Stores	CH-46D	0	0	0	0	0	0	0	0	0	0	
4.1.2.3	FRS Support Supplies	CH-46D	795.92	794.24	901.98	919.14	1,227.40	1,346.78	1,296.29	1,644.97	2,161.73	1,533.38	
4.1.2.4	FRS AVDLR	CH-46D	1,893.86	1,588.36	388.24	1,325.51	2,544.87	2,612.12	1,766.31	1,664.74	4,923.62	3,748.74	
4.1.2.5	FRS Fuel	CH-46D	784.14	434.02	402.12	371.67	450.13	404.8	299.77	338.5	406.2	371.91	
4.2	Subtot O/M Training	CH-46D	702.53	1,033.07	794.49	709.57	321.63	383.21	441	256.7	951.07	77.79	
4.2.1	Operational Training	CH-46D	225.29	260.79	228.55	253.14	70.23	45.92	75.73	0	287.23	15.46	
4.2.2	Maintenance Training	CH-46D	477.24	772.28	587.94	456.43	251.4	317.29	385.27	256.7	663.84	62.31	
5.0 (87-91)	Subtot Recurring Investment FY87-91	CH-48D	2,575.95	1,909.04	2,375.77	1,215.25	3,408.53	0					
5.0 (92->)	Subtot Recurring Investment FY92->	CH-46D	0	0	0	0	0	3,650.55	4,809.91	4,843.30	9,568.90	8,193.20	42,550.40
5.1 (87-91)	Replacement Repair FY87-91	CH-48D	417.37	0.24	422.11	0	0	0					31,085.66
5.1 (92->)	Subtot Modifications FY92->	CH-46D	0	0	0	0	0	3,650.55	4,809.91	4,843.30	9,568.90	6,193.20	
5.1.1	Kits Costs FY92->	CH-46D	0	0	0	0	0	3,602.95	4,535.71	4,721.91	9,208.30	7,019.24	
5.1.2	Spares Costs FY92->	CH-46D	0	0	0	0	0	47.6	274.19	121.38	360.6	1,173.95	
5.1.3	Installation Costs FY92->	CH-46D	0	0	0	0	0	664	988.9	402.13	157.54	0	
5.2	Modifications FY87-91	CH-46D	2,158.58	1,908.80	1,953.65	1,215.25	3,408.53	0					
6	Other Functions	CH-48D	605.38	234.79	235.13	191.33	225.15	296.14	195.67	200.13	332.54	384.38	2900.62
6.1	NETS	CH-46D	80.13	72.45	81.38	86.87	82	85.27	104.37	107.66	165.96	178.03	1406.86
6.2	CETS	CH-48D	205.38	162.08	153.17	101.88	110.28	133.27	91.29	85.82	61.12	118.53	
6.3	Publications	CH-46D	319.85	0.26	0.6	0.58	32.87	77.6	0	6.63	85.46	89.83	
A.1	Total Aircraft Number	CH-48D	24	22.5	27	28	26	29.1	30	26	28	28	
A.1.1	Regular Aircraft	CH-48D	19.1	17.5	20.7	20	20.1	20.8	22	21	21	21	203.20
A.1.2	Fleet Readiness Sq	CH-48D	4.9	5	6.3	8	5.9	8.3	8	7	7	7	65.40
A.2	Total Flying Hours	CH-46D	10,489.00	10,803.00	12,378.00	11,422.00	12,947.00	12,676.00	11,355.00	12,217.00	12,880.00	11,798.00	118,945.00
A.2.1	Regular Flying Hours	CH-46D	7,848.00	8,638.30	10,210.40	6,977.00	9,958.40	9,277.80	8,591.00	9,108.60	6,830.40	6,122.10	89,358.00
A.2.2	Fleet Readiness Sq	CH-48D	2,823.00	2,184.70	2,167.60	2,445.00	2,988.60	3,598.20	2,784.00	3,110.40	3,849.80	3,675.90	29,587.00
													Cumulative Average
	annual cost per flight hour		6.209	5.925	4.153	4.018	4.518	4.403	3.455	3.602	5.388	5.161	4.857
	utilization rate operation aircraft		400.31	493.62	493.26	446.85	495.44	446.05	390.50	433.65	420.50	386.77	439.75
	utilization rate FRS aircraft		576.12	432.94	344.08	407.50	506.54	433.52	345.50	444.34	549.94	525.13	452.40
	cost per flight hour without people		4.732	4.386	2.636	2.525	3.176	2.930	2.843	2.784	3.695	3.422	3.285
													16,996.10

CH-60 Option One

	A	B	C	D	E	F
1	**Total In-house Cost of Option One**					
2	**Detachment Personnel Costs for Two Aircraft Detachment**					
3	Manning	weighted average cost	Total Cost			
4	Officers	for each	for Detachment			
5	6	$76,853	$461,118	Weighted average is based on current HC community manning		
6	Enlisted					
7	15	$37,069	$556,035			
8						
9		total det manning cost	$1,017,153	per aircraft	$508,577	<<<Personnel cost/aircraft =C9/2
10				**Flight Training Cost**		
11	Amortized Flight Training Cost Per Pilot			$ 25,778	<<<= $340,000/13.5years	
12						
13				Per aircraft	$ 77,333	<<< = D11*A5/2
14						
15		**Total Detachment Personnel Cost Per Aircraft**			**$585,910**	<<< = E13 + E9
16						
17			**Capital Costs**			
18			Total		Per Aircraft	
19	Procurement cost of 32 CH-60s		$ 342,817,634		$ 10,713,051	<<< From learning curve
20	Salvage Value		$ 8,501,877		$ 265,684	<<<2.48% of Procurement cost
21	Annual Depreciation cost		$ 10,130,781		$ 316,587	<<<(procurement-salvage)/33
22	Annual Cost of Capital		$ 20,569,058		$ 642,783	<<<6% of Procurement cost
23	Collision Insurance cost		$ 5,999,309		$ 187,478	<<<1.75% of procurement cost
24	Liability insurance cost		$ 328,000		$ 10,250	<<<$6000 + 17seats* $250/seat
25	**Total of annual capital costs**		**$ 37,027,148**		**$ 1,157,098**	
26						
27			**Annual Operating Costs**			
28	Annual Operating cost Operational		$ 21,019,462		$ 750,695	<<<<C56 * C58
29	Annual Operating cost FRS		$ 6,085,654		$ 1,521,413	<<< C54 * C60
30						
31						
32						
33						
34			**Summation of Operating, Personnel, and Capital Costs**			
35	Total of annual capital costs		$ 37,027,148		$ 1,157,098	
36	Organizational Personnel costs					
37		For 14 two aircraft dets.	$ 16,405,475		$ 585,910	
38						
39	Annual Operating cost Operational		$ 21,019,462		$ 750,695	
40	Annual Operating cost FRS		$ 6,085,654		$ 1,521,413	
41				operational aircraft		
42	CH-60 total annual cost/aircraft		$ 69,823,691	<<< = E42 * 28	$ 2,493,703	<<< = E35 + E37 + E39
43						
44				FRS aircraft		
45	CH-60 total annual cost/aircraft		$ 10,714,047	<<< = E45 * 4	$ 2,678,512	<<< = E35 + E40
46						
47						
48						
49	Replacing 28 operational aircraft and 4 FRS aircraft with 28 contract aircraft					
50					Per Contract Aircraft	
51	Total In-House cost of Option One		$ 80,537,738	<<< = C42+C45	$2,876,348	<<< = C52/28
52	>>> = C35 + C37 + C39 + C40					
53						
54	Cost per Flight hour of HH-60		$ 3,362.98	1997 dollars/hour		
55						
56	CPFH less Sqd personnel cost		$ 1,707.08	1997 dollars/hour		
57						
58	Operational annual utilization rate		439.753937	hours/year		
59						
60	FRS annual utilization rate		452.4006116	hours/year		

CH-60 Option Two

	A	B	C	D	E	F
1	**Total In-House Cost of Option Two**					
2	**Detachment Personnel Costs for One Aircraft Detachment**					
3	Manning	weighted average cost	Total Cost			
4	Officers	for each	for Detachment			
5	4	$76,853	$307,412	Weighted average is based on current HC community manning		
6	Enlisted					
7	10	$37,069	$370,690			
8						
9		total det manning cost	$678,102	per aircraft	$678,102	<<<Personnel cost/aircraft =C9
10						
11	Ammortized Flight Training Cost Per Pilot			$ 25,778	<<<= $340,000/13.5years	
12						
13				Per aircraft	$ 103,111	<<< = a3*e3
14						
15	**Total Detachment Personnel Cost Per Aircraft**				**$781,213**	<<< = E13 + E9
16						
17	**Capital Costs**					
18			Total		Per Aircraft	
19	Procurement cost of 23 CH-60s		$ 246,934,092		$ 10,736,265	<<< From learning curve
20	Salvage Value		$ 6,123,965		$ 266,259	<<<2.48% of Procurement cost
21	Annual Depreciation cost		$ 7,297,277		$ 317,273	<<<(procurement-salvage)/33
22	Annual Cost of Capital		$ 14,816,046		$ 644,176	<<<6% of Procurement cost
23	Collision Insurance cost		$ 4,321,347		$ 187,885	<<<1.75% of procurement cost
24	Liability insurance cost		$ 235,750		$ 10,250	<<<$6000 + 17seats* $250/seat
25	**Total of annual capital costs**		**$ 26,670,419**		**$ 1,159,583**	
26						
27	**Annual Operating Costs**					
28	Annual Operating costs operational		$ 15,013,901		$ 750,695	<<<< c38 * c40
29	Annual Operating costs FRS		$ 4,564,240		$ 1,521,413	<<< c42 * C36
30						
31						
32						
33	**Summation of Operating, Personnel, and Capital Costs**					
34	Total of annual capital costs		$ 26,670,419		$ 1,159,583	
35	Organizational Personnel costs					
36		For 8 one aircraft dets	$ 6,249,705		$ 781,213	
37		For 6 two aircraft dets	$ 7,030,918		$ 585,910	<<< same as option one
38	**Total Squadron Personnel costs**		**$ 13,280,623**			
39	Annual Operating costs operational		$ 15,013,901		$ 750,695	
40	Annual Operating costs FRS		$ 4,564,240		$ 1,521,413	
41			operational aircraft			
42	CH-60 total annual cost		$ 51,486,193		$ 2,574,310	<<< = C42/20
43	>>> = C38 + C39 + (E34 * 20)					
44				FRS aircraft		
45	CH-60 total annual cost/aircraft		$ 8,042,990	<<< = E45 * 3	$ 2,680,997	<<< = E34 + E40
46						
47						
48						
49	Replacing 20 operational aircraft and 3 FRS aircraft with 20 contract aircraft					
50					Per Contract Aircraft	
51	Total In-House cost of Option Two		$ 59,529,183	<<< = C42+C45	$2,976,459	<<< = C52/20
52	>>> = C34 + C38 + C39 + C40					
53						
54	Cost per Flight hour of HH-60		$ 3,362.98	1997 dollars/hour		
55						
56	CPFH less Sqd personnel cost		$ 1,707.08	1997 dollars/hour		
57						
58	Opertional annual utilization rate		439.753937	hours/year		
59						
60	FRS annual utilization rate		452.4006116	hours/year		

NAVY VAMOSC (ATMSR)
REPORT DESCRIPTION
TABLE OF KEY PROCESSING CONSIDERATIONS/LIMITATIONS

1. Input data do not flow directly to the related output report elements without manual or automated preprocessing and allocation is required.

2. Input data received on listings or diskettes are key entered to processing site files.

3. Automated V&V includes edit checks during the production runstream and additional automated V&V of input data.

4. Data inputs, in most cases, are keyed either to UIC or TEC. Subordinate keys include AG/SAG, SSN, E/E, F/SF, MC, and TMS, as appropriate.

5. Two preprocessing routines for CNO FHP and training data are accomplished to overcome input data limitations related to weapon system (i.e. TEC) and activity (UIC) identification.

6. Most Marine Corps aviation personnel, aircraft, and operating costs are distributed to the Fleet Commanders because Fleet Marine Force (FMF) aviation units operate under Fleet Commander operational authority.

7. Intermediate level costs received for Naval Air Stations, Marine Corps Air Stations, and MALS are allocated to aircraft based on a data table cross-referencing bases (or MALS) to squadrons supported. Organizational level costs received for Naval Air Stations and Marine Corps Air Stations are allocated to the aircraft operated by the station.

8. ATMSR is constructed around squadron, base, and ship input cost data. Special functions and matrices have been developed to distribute aviation related O&S costs received from input for Wings, CNET squadrons, MALS, Detachments, ASOD/NSOD, and Training Wings.

9. Composite data is a collective term for source data other than CNO FHP and the CRP file.

10. Report production is currently a one-time annual batch process. Automated history files are used to produce special reports, as required.

11. Fleet Readiness Squadrons (FRS) are identified from a hard-coded table. FRS costs are identified as training costs and not regular operational costs. FRS costs are reported only for

MC CINCLANTFLT and CINCPACFLT.

12. ATMSR is primarily oriented to squadrons and stations operating Navy and Marine Corps aircraft. However, aircraft O&S costs are also incurred and reported at the UIC level for Wings, Detachments, and special purpose (Blue Angels, President's helo) aircraft.

13. Because source data are received at the UIC or TEC (T/M/S) level, special UIC and TEC summary files are established within the system to accommodate those data. Since aircraft flight hour data from the FHP does not specify individual UICs, the UIC summary files developed by a preprocessing routine (CRP file) serve that purpose.

14. Aircraft O&S costs reported under MC CNET are dedicated undergraduate pilot training costs. This includes training aircraft maintenance personnel costs.

15. Personnel costs for aviation capable ships company and aircraft carrier ship's company are contained in Navy VAMOSC-SHIPS reports.

16. The source for AVDLR costs is the CNO FHP. If aircraft maintenance for a TMS is performed under contract, AVDLR costs are generally subsumed in the contract amount and are not specifically reported by the ACC to the FHP.

17. TAD costs for intermediate level UICs are distributed to the organizational level to facilitate TMS identification.

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